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VOL XXVII

JANUARY-MARCH

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WHAT extraordinary phenomenon, which those who read many newspapers sometimes encounter, of the inspiration of two writers following tracks so closely parallel that their effusions are word for word the same from beginning to end, was recently to be observed in the case of the New York *Herald* and the Pittsburgh *Leader*, which published on the same day an article devoted to architects or, rather, to their incomes, which held up these fortunate professional men as objects to be envied, if not by all the world, at least by journalists, many of whom have just now a way of writing about rich men or women which suggests the idea that the journalist himself was brought up in a jail, and sees nothing but the pockets of those whom he favors with his attention. The present writers, after half a column or so of rubbish about the grandeur of American buildings, furnish the New York and Pittsburgh public with the information that "there are in the city of New York at least ten architects whose annual net income is in excess of a hundred thousand dollars, while in Philadelphia, Chicago, Boston and St. Louis there are quite as many who can spend a like amount of money every year without overdrawing their bank accounts." This is certainly very liberal to the architects, but what follows is even more so. "There are," we are told, in addition to the magnates just mentioned, "hosts of comparatively small fry whose annual profits will pass the fifty-thousand-dollar mark." If an architect whose net income is only a thousand dollars a week belongs to the "small fry," what name would these journalists have for the remaining insignificant beings who practise architecture faithfully and skilfully, and thank Providence sincerely if their year's work shows a profit of three thousand dollars? Yet, with a tolerably extended acquaintance in the profession, we are inclined to think that this list includes the greater part of the architects in this country. As to the architects whose usual income from their business is a hundred thousand dollars, they are pure myths. The New York-Pittsburgh authority mentions by name Mr. R. M. Hunt as one of them. As a counterpoise to this piece of information, we will mention what a worthy contractor once said to us about Mr. Hunt. The builders were not, in those days, very fond of our venerated President. He had altogether too many new ideas to suit their conservatism, which looked with horror on anything out of the common way. "The fact is," said the contractor, in a burst of confidence, "Mr. Hunt never could get a living at all if he hadn't a rich wife." By averaging these two pieces of misinformation, after the manner of the commissioners of statistics, one may, perhaps, get some sort of notion of what a very able and distinguished architect in New York, seconded by skilful and devoted assistants, can make out of his business; but men so successful are extremely rare exceptions in the profession, and the "hosts" of "small fry" whose annual profits amount to fifty thousand dollars, of course, do not exist. It would be a waste of time to notice such ridiculous assertions, were it not that they do a great deal of harm to the profession and the public: to the profession by making people believe that architects are combined to extort an unreasonable compensation for their work; and to the public by spreading the idea that the profession of architecture is just the one in which their sons can become rapidly rich without much trouble. It would be a useful thing to publish here, as is done in England, the value of the estate left at their death by architects of distinction, although in many cases this is greatly increased by inheritance, by marriage, by fortunate investments or by outside employment; but, if this should be done, it would be not less useful to publish also a few true accounts of the early trials and struggles of architects. How many of them have we known who have given drawing-lessons, illustrated books, designed wall-papers, supervised laborers, delivered lyceum-lectures or written for newspapers, happy if they could earn two dollars a day while waiting for a vacancy in the "hosts" of architects with a thousand dollars a week income. How many more, who were glad of the help of their faithful young wives in eking out the living which had love for its principal ingredient. And of those who have persisted until time and opportunity have brought them a comparatively assured, though modest position, how many have found their way to it through architecture? If we are not mistaken, less than half of the trained students in architecture turned out by our technical schools are to be found in the profession six years later. The others, ascertaining, on a closer view, that their expected income of fifty thousand dollars a year is farther off than they anticipated, and that fifty thousand cents is about as much as they can expect for a good many years to come, drift away into other employments, and some of them, no doubt, will be much astonished to learn from the newspaper reporters what they have missed.

WE regret very much to hear of the death of Mr. George F. Durand, Vice-President of the Canadian Society of Architects, which occurred at London, Ontario, last week. Mr. Durand was young in the profession, being only thirty-nine years old, but was very widely and favorably known among architects and the public, both in Canada and elsewhere. He was a native of London, but after spending a short time in the office of the city engineer there, he went to Albany, N. Y., where he was employed by Mr. Thomas Fuller as his chief assistant in the work on the new capitol, which was then in Mr. Fuller's hands. When Mr. Fuller was superseded, Mr. Durand left Albany with him, and, after a year spent in Maine, with a granite company, he returned to his native city, where he soon found constant and profitable employment, having for several years built a large part of the most important structures in Western Ontario. The London *Advertiser*, to which we owe most of our information as to his works, offers to his relatives and friends the sincere sympathy of the public which it represents, and we are sure that the architects of the United States will join with their brethren in Canada in mourning the loss of one who, at so early an age, had conquered for himself so conspicuous a place in his laborious profession.

SOME interesting experiments on concrete arches were made recently, during the construction of the new railway station at Erfurt. Some of the rooms were to be covered with concrete floors, carried on iron beams, while others, of smaller size, were intended to be spanned by arches extending from wall to wall. One of the latter, something over seven feet in width, was covered with concrete, flat on top, and forming on the underside a segmental arch, the thickness of the material at the crown of the arch being four inches, and about eleven inches at the springing. The concrete was made of "Germania" Portland cement, mixed dry with gravel, moistened as required, and well rammed on the centring; and skew-backs were cut in the brick walls at the springing line, extending two

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courses higher, so as to give room for the concrete to take a firm hold on the walls. Fourteen days after completion, this floor was loaded with bricks and sacks of cement to the amount of more than six hundred pounds per square foot, without suffering any injury, although, after the load was on, a workman hammered with a pick on the concrete, close to the loaded portion, so as to provoke the cracking of the arch if there had been any tendency to rupture. In the other cases, the concrete arches being turned between iron beams, the strength of the floor was limited by that of the beams, so the extreme load could not be put on; but the curious fact was established that a section of concrete flat on top, and forming a regular segmental arc beneath, was far stronger than one in which a portion of the under surface was parallel to the upper; showing, apparently, that the arched form, even with homogeneous concrete, causes the conversion of a large part of a vertical pressure into lateral thrust, reducing by so much the tendency of the load to break the concrete transversely. This observation is important theoretically as well as practically. It has been of late generally maintained that a concrete arch is not an arch at all, but a lintel, without thrust, and that the common form, flat above and arched beneath, is objectionable, as it gives least material at the centre, where a lintel is most strained. The Erfurt experiments directly contradict this view, and it remains for some students of architecture to render the profession a service by repeating them, and, at the same time, actually determining the thrust, for a given load, of arches of particular forms. Until this is done, the concrete construction, which is likely, we may hope, to become before many years the prevailing one in our cities, will be practised with difficulty and uncertainty, if not with danger. Incidentally, a trial was made of the effect of freezing on the concrete. The floor of a room arched in four bays, between iron beams, had just been finished when the weather became cold, and on the morning after its completion the thermometer stood at twenty above zero. The concrete had not been protected in any way, and the contractor was notified that it had been frozen, and must be removed. This was early in December, and it was about the first of April before the work of removal, preliminary to replacing the concrete with new material, was begun. Three bays had been wholly or partly removed when the hardness of the concrete under the workmen's tools attracted attention, and the arch remaining intact was tested with a load of three hundred pounds per square foot, which it bore perfectly.

THE question how far an architect can be held responsible in damages, in cases where the cost of work exceeds the estimates, is examined in a recent number of *La Semaine des Constructeurs*, and some considerations are mentioned which are new to us. According to Frémy-Ligneville, the most familiar authority on the subject, the architect incurs no responsibility whatever, either for his own estimates or those of other people, unless he intentionally and fraudulently misleads his client by a pretended estimate. In this case, as in that of any other fraud, he is liable for the results of his crime. Except under such circumstances, however, the architect's estimate of cost is simply an expression of opinion, the correctness of which he does not guarantee, any more than a lawyer guarantees the correctness of an opinion, although important interests may depend upon it. The owner can estimate the value of the architect's opinion, as of the lawyer's, by the professional reputation of the man who gives it, and, if he wishes to be more secure, he can go to another architect, as he would to another lawyer, for an independent estimate. Moreover, if the owner of the projected building is still anxious that the cost should be strictly limited to the sum estimated by the architects, he can have a contract drawn by which the builder shall be obliged to complete it for that sum, and can have his plans and specifications examined by competent authority, to see if they include everything necessary. This ought to make him reasonably sure what his house will cost him, provided he does not himself make changes in the plans or specifications. If he has omitted to take this precaution, and, as his building goes on, he finds that it is likely to exceed the estimate, he has another excellent opportunity to protect himself, by ordering immediately such changes in the plans and specifications for the work yet remaining to be done as may reduce the expense to the desired amount, and by doing so he generally suffers no damage, as, if he does not get all he expected to for his money, he gets all his money will pay for.

WITH all these opportunities for revising and testing the correctness of an architect's estimate, the man who neglects to avail himself of any of them, and who allows the work on his house to go on, after it has become evident that it will cost more than the estimate, has, according to M. Frémy-Ligneville, no claim against any one on account of his disappointment. Of course, the architect should be as careful in his estimates as his experience allows him to be, and any conscientious man would try not to mislead a client, but both he and his client must remember that when the tenders of the builders themselves usually vary from fifty to a hundred per cent for the same piece of work, an architect's estimate cannot be anything more than an opinion. Moreover, the architect should not forget that, being an opinion, and not a guaranty, he is not only at liberty to modify it as much and as often as he sees fit, but is bound to do so, and to inform his client at once of the change, when fuller information, or alteration in the circumstances, shall show him that the original estimate is likely to be exceeded. If he does this frankly, although his client may be disappointed, he cannot reproach the architect with trying to deceive him, and there will probably still be time to make the changes necessary for reducing the expense to the desired point. In a case decided in Paris in July, 1855, a man was condemned to pay fifty-four thousand francs for repairs done on a house. He proved that his architect had estimated the expense at seven or eight thousand, but it was shown that the architect had subsequently informed him that it would be necessary to do more work than was at first contemplated, and that he had made inquiries about the matter, and had turned out his tenants so that the work might be done, and had paid the contractors more than the sum originally estimated; and the court thought he had no case at all against the architect.

THE great building firm of Peto Brothers, in England, having been awarded a contract for a large public building, have taken advantage of what, as they say, they consider a favorable opportunity to initiate a system of profit-sharing with their men, in accordance with a circular which is printed in the *Builder*. The system described by the circular is very simple. It is to apply for the present, only to the contract mentioned, but, if it works well, will be extended to future cases. Under the arrangement proposed one-quarter of the net profits of the contract are, when the building is done and the accounts settled, to be divided, as a bonus above their wages, among the men who have worked on it, in proportion to the wages they have earned. The conditions under which each man is entitled to his share are that he shall have worked long enough on the contract to have earned five pounds, at the regular rate of wages; that he shall not have neglected his duty, or misconducted himself, or wasted his time, or in other ways have acted so as to diminish the profits of the contract, or injure the reputation of the firm for good and honest work; and, that he shall not have engaged in any strike for shorter hours, or for wages above the schedule of wages which prevailed at the time the contract was made, and upon which the contract price was based. That the workmen may assure themselves of the fairness with which the division is carried out they are invited by the circular to send a representative to watch the making-up of the accounts by the auditor of the firm, and to sign the balance-sheet. In order to identify the claimants, every man must obtain a printed ticket from the time-keeper, on beginning his work, countersigned by the foreman, and noting the day and hour when his employment commenced, with his name, number and wages. This is to be again signed and countersigned when he leaves, and must be produced to secure a share in the dividend. Unpretending as it is, this bids fair to be one of the most interesting experiments in social science yet tried, and unless the trades-unions in England have forgotten their prowess, it will not be carried out without a struggle. Our readers will remember Mr. Lewis H. Williams's experiences in trying a similar plan with his carpenters in New York, and his final victory, but he had only one union to contend with, and that not a very compact one, while Messrs. Peto Brothers will have all the building trades about their ears at once, and the great question whether men shall be allowed to do only a fixed amount of work in a day, and that amount as small as possible, or whether they shall be allowed to work as they please, will be fairly brought before the parties for decision.

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THE APARTMENT-HOUSE.

"THE SURE REVOLVING TEST OF TIME — PAST AND PRESENT"
CARTOON FOR SGRAFFITO BY HEYWOOD SUMNER

From *Building News.*

MOST people are willing to admit that they cannot afford to pay over twice as much for a thing as it is worth; but few in this country are aware that they do this very thing when they build for themselves an independent city dwelling-house or pay a rent equivalent to or greater than the interest on this outlay.

In the old country the secret of obtaining luxury and economy combined in building has been learned, and rich and poor, fashionable and unfashionable alike live in "flats." In America, people have not yet learned this lesson, but cling to the old and barbarous custom of living *perpendicularly* in isolated towers, with all the cares and worries that go with isolated management.

Nothing shows more clearly than this, how much man is a creature of habit. In his savage state, the nature of his existence necessitated the isolated hut. As civilization advanced, however, the necessity for, and enormous advantages of coöperation became evident, but habit perpetuated the isolated dwelling long after the reasons for its existence had disappeared, and it required centuries for civilized men to learn that coöperation is an element as essential to perfection in the arrangement of their habitations as it is in other things.

A given accommodation may be obtained in the form of a "flat" for less than one-half the outlay required to obtain it in the form of an independent dwelling built on the same land.

The form of comparison herein presented has never, to my knowledge, been heretofore made, and the results are as surprising as they are important and interesting.

The estimates of cost have been made by several competent contractors on scale drawings and accurate specifications, are easily verified and hence may be accepted as reliable.

Figure 1 is one of the plans of our apartment-house which is to be built on the Back Bay, Boston.

Figure 2 shows the floor-plans of an independent house which might be built on the same land. Both figures are drawn to the same scale for convenience in comparing the dimensions. The independent-house (which I shall, in contradistinction to the "flat," designate as the "tower" to mark its prominent point of difference from the "flat" in form) contains a kitchen, pantry, furnace-room, fuel-cellar, laundry, dining-room, china-closet, parlor, eight bed-chambers provided with suitable closets, two bath-rooms, a trunk-room, a front staircase extending from the first floor to the attic, and a back staircase extending from the basement to the third floor. What will these accommodations cost in this form and what in the form of a "flat" in an apartment-house?

The apartment-house contains a public kitchen, steam-heating, ventilating and electric-lighting isolated plants, fuel-cellar, laundry, café, billiard-room, gentlemen's smoking-room, ladies' parlor, small public dining-rooms, and eighty suites, *averaging* five rooms, a bath-room and closets in each, and with a trunk or storage-room in the basement for each suite; four elevators and four fireproof staircases of iron and marble enclosed in brick walls from basement to roof.

The suites are of different sizes to suit the proposed occupants, and will have from two to twelve or more rooms of varying dimensions as desired. They are partly "housekeeping" suites, *i. e.*, having kitchens and dining-rooms; partly "hotel" suites, *i. e.*, having neither kitchens nor dining-rooms, the occupants preferring to use the public café and dining-rooms; and partly "semi-housekeeping" suites, *i. e.*, having dining-rooms and china-closets with dumb-waiters connecting them with the public-kitchen, but no independent kitchen. The "housekeeping" suites require one more bed-room than the others, to accommodate a private cook.

Assuming now at first in our comparison those conditions which are least favorable to the apartment-house, we will take one of the "housekeeping" suites, having precisely the same number and size of rooms as we find in our independent house or "tower" and compare costs.

The only difference in the accommodation in each case is that, in the "flat," the rooms are accessible to one another without the use of stairs, while in the "tower" six flights of stairs in all are used, constituting in the aggregate a ladder, as it were, of about a hundred steps; also in the fact that in the "tower" the owner has to manage his own heating, ventilating and hot-water supply apparatus, while in the "flat" this work is done for him; that in the "tower" wooden staircases and no elevators are used, while in the "flat" fireproof staircases enclosing elevators are provided; that in the "tower" the main partitions are often of wood while in the flat they are of brick a foot thick and each "flat" is separated from its neighbor by a brick wall a foot thick and all the floors are completely deadened against the transmission of sound; and finally that in the "tower" no external fire-escape is provided, while the "flat" has convenient external fire-escapes of iron. Otherwise the accommodations are in both cases precisely the same.

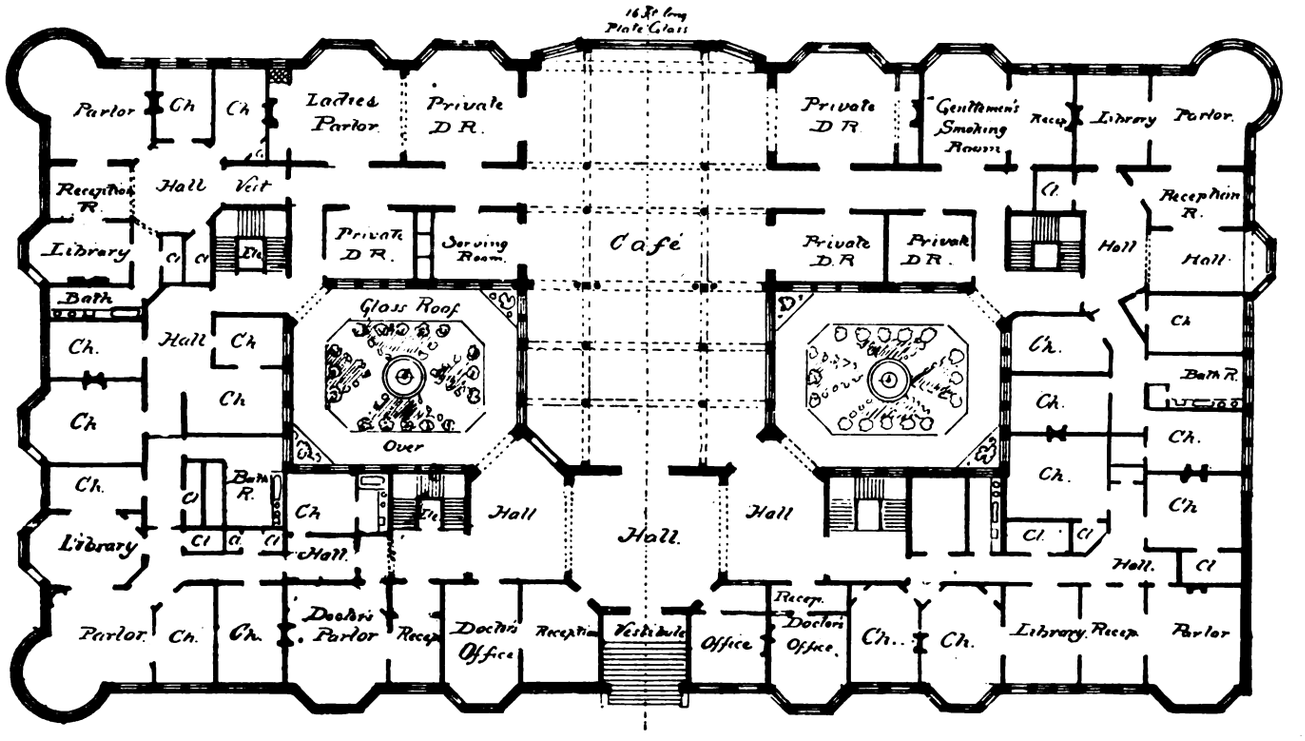

Figure 1.

The total cost of this apartment-house, including the building-lot valued at, say, $5 a square foot, has been carefully estimated at $617,771.

This is the highest of two competitive estimates given by two responsible builders, and comprises general cooking-plant, electric-lighting, steam-heating and ventilating apparatus, iron staircases and fire-escapes, elevators, copper roofing, architect's commission, and, in short, everything required for occupancy and use except wall-paper.

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The first floor contains 16,688 square feet of available room. (By "available" I mean room which is directly occupied by, and which must be separately provided for each owner. That is, it excludes staircases, furnace, laundry, etc., which might be used in common by many owners and therefore need not be duplicated for each, and which are only indirectly serviceable to each owner in contributing to the usefulness of those which are directly enjoyed.) The six floors above contain 23,288 square feet of available room each, making a total of 156,416 square feet. Adding 10,880 square feet for basement storage and trunk-room for the suites, and 2,000 square feet in the basement for barber's shop, apothecary, carriage and other offices along the street fronts, we have a total of 169,296 square feet of available room in the entire apartment-house. Dividing the total cost $617,771 by this figure we have $3.65 for the cost of each square foot of available room in the building.

Our "tower" measures twenty-five feet front on party lines, by seventy feet deep. Its available rooms comprise parlor, library, music-room, eight closeted-chambers, two bath-rooms, a trunk-room, a dining-room, and we may add a kitchen for those who still believe in having an independent cook.

The area of these rooms is as follows:

Parlor	374 sq. ft.	Chamber No. 6	286 sq. ft.
Library	374 "	Chamber No. 7	242 "
Music-room	154 "	Chamber No. 8	315 "
Chamber No. 1	384 "	2 Bath-rooms	144 "
Chamber No. 2	528 "	Trunk-room	136 "
Chamber No. 3	170 "	Dining-room	408 "
Chamber No. 4	252 "	Kitchen	384 "
Chamber No. 5	162 "	China-closet	136 "
Other closets	410 sq. ft.		

Making a total of 4,859 square feet of available room in the "tower." Its total cost on a twenty-five foot lot of the average depth on the Back Bay, *i. e.*, 112 feet, the land being valued as before at $5 per square foot, would be at the lowest estimate $32,000 at the present prices, the wood finish being equally good with that in the "flat." If we figure, however, for the same style of lighting, heating, ventilating and fireproofing, and provide an elevator and outside fire-escape, the cost could not be put below $40,000.

The same amount of available space, *i. e.*, 4,859 square feet in our "flat" would cost at $3.65 per square foot as above estimated, $17,735.

If now we consider that the management of a private kitchen and an Irish cook does not actually constitute the essence of a home in its broadest sense, but, that on the contrary, it really deprives a home of its greatest charm, namely, peace of mind and rest of body, the kitchen and the cook's bed-chamber may be omitted from our "flat" in view of the public kitchen. The area of our "flat" then becomes 4,475 square feet, which, at $3.65 per foot, brings the cost down to a little over $16,000.

Finally, if we omit the dining-room also, with its china-closet, our area becomes 3,931 square feet, and the cost only $14,350 for the "flat," against $40,000 for the "tower," the former being but little over a third of the latter.

So much for the saving in the case of a large family and large suite. For a small suite, such as would be required for a single person, or a small family of two or three persons, the saving at once mounts to a very much larger figure; so much so, indeed, as to render the use of the isolated house in such cases a most inordinate extravagance, except for the very rich. Thus a single person, or a family of two or three, could be very comfortably provided for with three or four rooms, and a bath-room in an apartment-house having a good café. Estimating the rooms to measure 18 x 22 feet, their area would be a little over 400 feet each, including closets, and their cost $1,460 apiece; or for smaller rooms of, say, 14 x 15 feet, or 224 square-feet surface, the cost would be but $818 apiece. An isolated dwelling, on the same land, of only eighteen feet frontage and fifty feet deep, would cost, including the lot at $5 a foot, not less than $18,000 or $8,000, without the land. Of course, in such an isolated dwelling, electric-lighting, steam-heating, fireproof stairs, and other luxuries of the "flat," would hardly be expected.

By the arrangement of our apartment-house, there are twenty-four corner-suites out of the eighty. These have direct sunlight on either one or both of their exposed fronts, and may be estimated as worth fifty per cent more than the rest. In other words, $\frac{3}{10}$ of the whole available room space is worth fifty per cent more, and $\frac{7}{10}$ correspondingly less than the average price of $3.65 per foot. Therefore, $3.65 x $1\frac{1}{2} = \$5.47$ = price of corner-suites per foot. $\frac{3}{10}$ x the total area 169,296 square feet = 50,788 square feet x $5.47 = $277,810, which, deducted from $617,771, leaves $339,961 to represent the total cost of the remaining $\frac{7}{10}$. The total area 169,296 x $\frac{7}{10} = 118,507$ square feet of available space in the inner-suites. Hence $\frac{\$339961}{118507} = \$2.86$ as the price per square foot of the inner-suites, or all suites which are not corner-suites.

Now, as our estimates on the "tower" were made on the basis of its being an inner building in a block and not a corner-house, our estimates for the "flat" should be on a basis of $2.86, instead of $3.65, as taken. Therefore, our suite of 4,859 square feet would be but $13,896 if the "flat" were any other than a corner one, and if the public kitchen and café were used, it would be $11,242, or *but a little more than a quarter of that of the "tower!"*

The foregoing figures are easily explained, and their correctness verified by the following simple diagrams and considerations:

In Figure 2 the shaded parts of the plans represent the unavailable room which, under the apartment-house system, are rendered unnecessary, and they are practically wasted. Thus the eighty

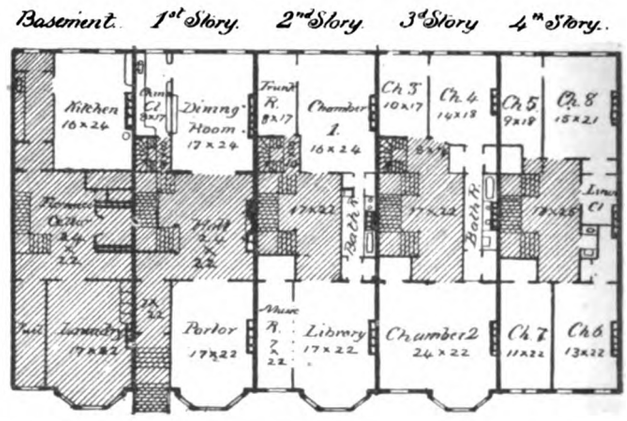

Figure 2.

families, by uniting their eighty homes in one coöperative apartment, save 156 staircases consisting of seventy-six front and eighty back staircases, seventy-eight furnaces, seventy-nine laundries, etc., and nearly all the space they occupy, and the land, foundation and roof they represent.

This waste space may be graphically shown by the diagrams in Figure 3. The large black-and-white line represents the "tower," and the shorter the "flat." The black part of each line denotes un-

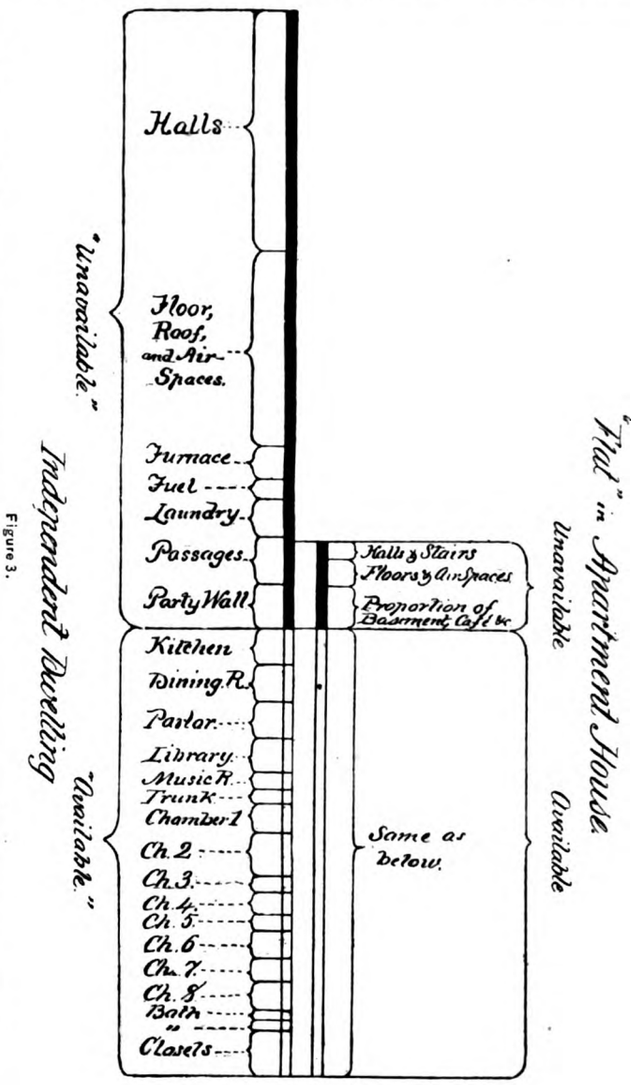

Figure 3.

available, and the white part available room, the sum of the two denoting the total cubical contents of each dwelling. The white parts of the lines measure the same length in each case, because the amount of available room in "tower" and "flat" is assumed at the outset to be the same. Thus in the "tower," the front and back staircases and halls take up 22,000 cubic feet out of the total 106,000

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cubic feet covered by the entire building. In the "flat" the proportional part of the halls and staircases for each suite is represented by a comparatively insignificant quantity as shown.

Again, an enormous waste is shown in the flooring, roof and air-spaces of the "tower," while this item is but a trifle in the "flat." The six floors, each 16 inches thick, and the roofing make up together in the "tower" 12,000 cubic feet, or nearly the equivalent of an entire story. Add to this 12,000 cubic feet of air-space under the roof and over the concrete, and we have in these items a waste of 24,000 cubic feet, against only 4,000 in the "flat."

Thus we see that the waste space in the "tower" actually exceeds the available. Yet it must be paid for at the same rate with the latter. Deducting the waste in the "flat" from that in the "tower," we find the balance of waste space in the "tower" to be equal to the available, showing graphically that the "tower" must cost, in these items alone, just twice as much as the "flat."

Figure 4 shows a block-plan on a very small scale of the apartment-house, and a block-plan on the same scale of 40 "towers"

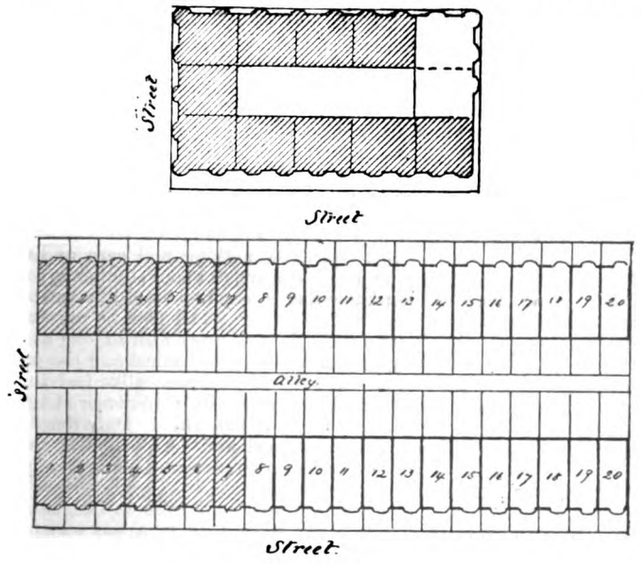


Figure 4.

adjoining each other, and having the same available space as the apartment-house. These plans show how much more land is required to give the same accommodations (minus the conveniences and luxuries of an apartment-house) in the "tower" system than in the "flat."

The shaded portions in each block-plan represent the aggregate of available room in each case. This shows very strikingly what an enormous proportion of land and material is wasted in the "tower" system.

In short, the possible saving in first cost for each family adopting the "flat" system of building lies between $14,265 and $28,758, making an aggregate saving for the 80 families occupying the apartment of between one and two millions of dollars.

The annual running expenses are also greatly in favor of the "flat" system when the advantages of coöperation are used to its greatest extent.

Eighty independent Irish cooks give way to a professional *chef* and half-a-dozen *attachés*. The wages and maintenance of the 80 cooks would amount to an annual sum of not less than $40,000; those of the *chef* and his assistants to hardly $10,000, making in this one item a possible annual saving of $30,000.

The management of the 80 independent Irish cooks, if possible at all, could only be accomplished by the constant struggle of 80 worried and largely inexperienced owners or their wives. The management of the *chef* and his *attachés* could more easily be managed by a single person, either selected from among the 80 families and suitably recompensed, or employed as a professional manager at a regular salary. Or the entire control of the *café* and kitchen could be let out by contract to some suitable caterer, if preferred.

Corresponding savings are evidently possible in every other department of housekeeping, including steam-heating, ventilating, laundry-work, lighting and elevator-work. In all of these particulars, coöperation, judiciously conducted, has been shown to yield surprising economies.

But there are other advantages even more important than its economy in favor of the "flat." Freedom from housekeeping cares has already been touched upon. In the "tower," life is spent in training and treating with servants, mechanics and market-men. The private cook is a volcano in a house, slumbering at times, but always ready to burst forth into destructive eruption. True repose is out of the question, and we are told that "the motive for foreign travel of perhaps one-half of Americans is rest from household cares and the enjoyment of good attendance, freed from any responsibility in its organization and management."

Security against burglary and fire is another. In a good apartment-house, trained watchmen stand on guard night and day to protect the occupants, and stand-pipes, hose and fire-buckets are provided in all the halls, and kept in repair for emergency.

The family may leave their apartments for travel summer or winter, knowing that their property is as secure as modern appliances, system and ingenuity can make it. Not so with our isolated dwelling. The cost of providing all these means of protection is too great to make them practicable. The result is that the fear of burglary and fire at all times causes uneasiness, particularly on the part of the wife during the absence of her husband.

Beauty in the architectural arrangement of the rooms is a third advantage of the "flat." In this it has all the advantage of the double house or residence of the immensely rich. The rooms may be grouped in a manner which renders possible the highest architectural effect, whereas in the "tower" the perpendicular arrangement evidently precludes such opportunity by limiting the design to a wearisome and monotonous repetition from basement to attic.

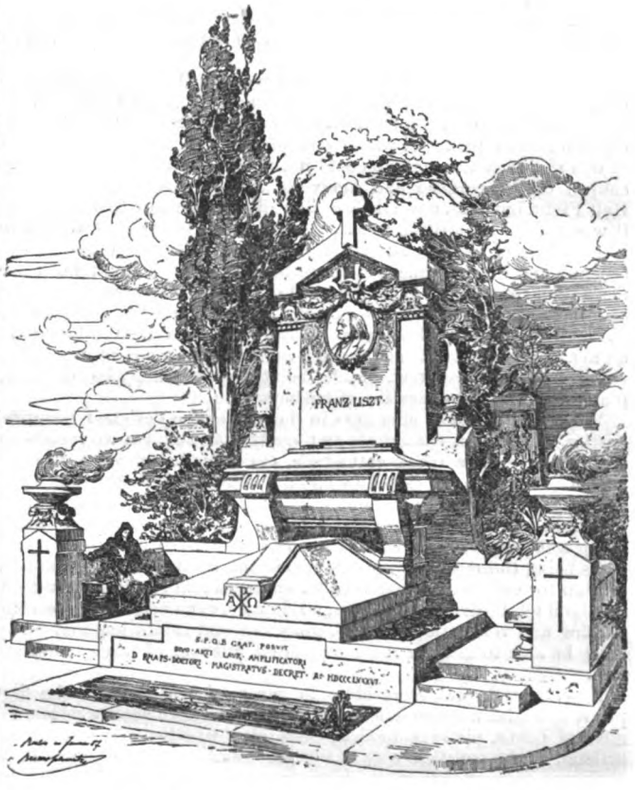
No argument can be sustained against the "flat" on the ground of transmission of sound or want of privacy and isolation, for sound may be as fully deadened as in the "tower" by means of the 12-inch brick separating walls shown in our plan, and the most improved deafening treatment of the floor-joists.

Isolation may be made complete in the "flat," the private halls and front doors of each suite being in every respect the equivalent of those in the "tower"; the only difference being that with the "flat" the outer world begins with the public hall and its elevator, while with the "tower" it begins with the public street and its horse-car.

Add to these advantages the possibility for a greatly enlarged and delightful social intercourse which a properly arranged and conducted apartment-house provides, and we have as near an approach to the ideal of a human habitation as has yet been devised.

J. P. PUTNAM.

ARCHITECTURE IN BROOKLYN.



THE city of Brooklyn has at last waked up to realize her size and importance architecturally. Brooklyn, though growing very rapidly and having many buildings of importance, has really had very little good architecture, for the simple reason that the profession, not being in any way organized, could not, as a rule, receive the treatment due respectable architects. For this reason many young men who would not be capable of practising elsewhere, have flocked to this city, and by various methods, many of which are far from honorable, have succedded in getting control of most of the work. However, we hope for better things.

The Brooklyn Institute some time ago decided to organize a Department of Architecture, and for this purpose a meeting of architects was called, which led to several more meetings and the attendance at these was exceedingly hopeful for the new department, some forty or fifty architects signifying their willingness to help along in the work; finally a public meeting was held in the Institute on

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Friday December 13, at which some six or seven hundred persons were present, and the Department was fully organized; the constitution carefully thought-out at the previous meetings was adopted, and the following list of officers chosen:

President, G. L. Morse; *Vice-President*, Louis De Coppet Berg; *Secretary*, William B. Tubby; *Treasurer*, Gustave A. Jahn; *Committee on Current Work*, Richard M. Upjohn, R. L. Daus and Louis De Coppet Berg; *Committee on Museum and Library*, Walter E. Parfitt, Pierre Le Brun; and Wm. Hamilton Gibson; *Committee on Competitions and Awards*, R. L. Daus, D. E. Laub, Russell Sturgis; *Committee on Professional Practice*, Walter Dickson, Albert F. D'Oench, Richard M. Upjohn; *Committee on Social Intercourse*, H. P. Fowler, Charles T. Mott and General Ingram.

During the necessary intervals of balloting, etc., the President, Mr. George L. Morse, made a short address, setting forth the history of the previous meetings, and congratulating the local architects on the prospect of having a strong and well-organized society.

Mr. Louis De Coppet Berg, of the firm of J. C. Cady & Co., Architects, then addressed the meeting as follows:—

When a young man enters a profession, and particularly the profession of architecture, if perchance he gets an original idea, or a little knowledge, he at once becomes very secretive, tries to keep it all to himself for fear some one else will benefit by it, and marks all his drawings "The property of . . . . ," and "Not to be copied, or used, without the consent of the author, *under penalty of the law.*" As he grows a little older in his profession he begins to find out that a few others have ideas as well as himself, and know a little something once in a while; and as he grows still older he finds that there are a great many others, who know a great deal more than he does, and who have a great many better ideas than he has; and then it is, that he longs for communication with his professional brethren, and he finds that, in order to get the benefit of their ideas and knowledge, he must freely communicate his own to them. Hence it is that in most of the large cities we find some association of architects; Brooklyn, however, the third city of the Union, is unique in this respect, that it has absolutely no place where professional architects can meet and discuss the different problems of their profession.

To remedy this evil, the Brooklyn Institute proposed to establish a Department of Architecture, and for this purpose called together a large number of local architects.

Now, we have decided that, if we have any Department at all, it shall be a live one; and this reminds me of a squib I read in the paper the other day, telling how, somewhere in Spain, they had unearthed an old painting, which was pronounced a genuine Murillo. It was said that the experts could not as yet determine whether the subject of the cracked and dingy old canvas was a Madonna or a Bull Fight, but that, nevertheless, they did not hesitate to declare that it was a great acquisition to art. Now, that is the trouble with most associations of architects; if the subject for discussion is only old, cracked and dingy enough, they are happy. Nothing delights them more than to spend all their time and energies in discussing Etruscan or other antique architectures, or the exact differentiations between the many styles of architecture. Now, while we value the history of an art, and shall give it all due attention, we propose to remember that the modern architect, besides being an artist, must be one of the most practical and executive of business men.

We admit that our ancestors in the profession designed beautiful castles, magnificent cathedrals and lovely châteaux, but we remember that these castles, these cathedrals, these châteaux were planned without any comfort; that they had no plumbing devices, no methods for cooking, no systems of heating or ventilation, and no way of getting light but the miserable taper; while to-day the architect, besides being a thorough artist, who knows how to design and to color, besides being thoroughly up in the history of his art, must know how to plan for comfort, to construct for strength and stability; must understand all the details of boilers, machinery, dynamos, electric-wiring, heating and ventilating systems, plumbing and sanitation, and lastly must be able to manage the complicated finances of large undertakings.

Now, to carry out these ideas in our work, we shall, in the first place, establish a museum and library, to which we shall welcome all gifts of books, pictures, models, casts, etc., whether illustrating the artistic, or the practical side of the profession. Then we shall have a course of monthly, public lectures by competent authorities, the subjects of which will probably be very largely chosen from the artistic side of the profession. We also propose to have stated meetings of the Department monthly, at which some carefully selected papers will be read by experts, the subjects of which will be given out as long in advance as possible, in order that all may be thoroughly prepared for a full and open discussion; and then, after these meetings, in order to promote sociability amongst the members, and to show how thoroughly practical we are, we propose to have something to eat. We also hope later to establish schools, not only for young men, but particularly for draughtsmen, where they can be taught, not only the art of drawing, but also the many practical branches connected with the profession.

The meeting was also addressed by the Rev. Dr. Chas. H. Hall, President of the Associate Members. He spoke at great length and kept his audience intensely interested by describing his own acquaintance with architecture, beginning with the original negro log-house down South, then the prim buildings of old Andover and Harvard, and finally how he saw the great former St. Ann's of Brooklyn, the likeness of which, he said, could be seen any day on the piers of New York when they were unloading dry-goods boxes; and how he finally went abroad and saw the beautiful architecture of Paris, which he could not praise enough. He was also unstinted in his praise of the modern beauty and architecture of Washington. He also spoke of his visits to London, and, while he admitted that Englishmen thought their architecture beautiful, he took exception, and claimed that the great St. Paul's, though beautiful to the English eye, was a cold barren building, blacked with smoke inside and out, a place where you could not be comfortable, nor hear the speaker at any distance. We regret that we are not able to give a verbatim account of his witty address.

At the end of Dr. Hall's address, the lecturer of the evening, Professor Russell Sturgis, architect, of New York, addressed the meeting as follows, his subject being "The Study of Architecture," with particular reference to the architecture of to-day.

Address of Mr. Russell Sturgis.

With regard to architecture and all the arts of decoration, there is a strange difference between the practice of them, and such study as looks toward practice, on the one hand, and the history and theory of them, with such study as that involves, on the other. Quite completely are these two studies separated, each from the other. A man may be most active and successful as a practising designer, and successful in an artistic way, too, with no knowledge and little thought of the history of his own branch of art, and with little curiosity as to its philosophy or its poetry. And, on the other hand, a man may be a very earnest student, and a happy and delighted student of the history and criticism of art, and know nothing, and care as little, about the profession or practice of any art, or about studio ways and studio traditions. I do not know that in any branch of human study this distinction is so marked and so strong. This is to be regretted, for many reasons, but it can hardly be done away with so long as the community is generally careless of both the theoretical and the practical — so long as the students and the practitioners alike feel themselves nearly isolated units, floating in a sea of good-humored indifference. This state of things only time can alter. Only time can civilize our new community in intellectual and perspective matters; but there are some other conditions which are more immediately in our power to modify, perhaps — let us see:

It is as true as if it had not been repeated, even to fatigue and boredom, that the arts of decoration have been in a bad way for a good part of the century past, at least among some European and Europeanized nations. I do not imagine that a Frenchman would admit that architecture and the arts of decoration had ever languished in his own society. Your cultivated Frenchman would say that some periods were better than others, but that there were no bad periods; he would say that, to be sure, the style of the First Napoleon's Empire was not a very fortunate style, — too stiff, too absurdly pseudo-classic, unworthy of France, a poor enough successor of the dainty and playful art of Louis XV, or the somewhat more refined and restrained art of Louis XVI: but he would say that it was art still, and the period a not wholly inartistic period; and even of the dull times of the Napoleon of Peace, from 1830 to 1848, while he would confess to a great deal of languor and lack of public spirit of all sorts, except in the struggle which the Romantic artists, headed by Delacroix, waged with the Classicists, headed by Ingres; while he would admit that the abundant wood-cuts and lithographs, the painting and statues much less abundant even in proportion, and the buildings very few and unimportant, were not sufficient to make up a great artistical epoch, that is, for France; yet as for its being an epoch without art, — such a thing as that, he would say France had not known since she was France. And he would be right.

But if said of England it would be pretty nearly true, if it were said that the whole amount of art of the decorative kind that existed in England between 1810 and 1850, for instance, would fill but a small museum, and that its quality would fill but slight requirements, it would require a bold Anglophil to contradict. There came a dull pall, like that of her own black fogs, over social London, and the stucco-fronted languors of Baker Street and Portland Place are no worse than were the dull monotony of the interiors behind them. Veneered and polished mahogany furniture, very much too large and too heavy for the rooms; black haircloth, like the grave clothes of Art, for the covering of everything that could be sat upon; cold, brownish-red curtains, of shiny but not lustrous material; silver candlesticks of monstrous design, — these, and such as these, were the decorative objects which our fathers or our grandfathers admired, or felt that they must admire for want of better, during the unhappy years that I have cited. The delicate carvings that the furniture of a generation just previous had received, were forgotten. People put up with Chippendale chairs in their dining-rooms because they had belonged to their fathers and nothing special was offered to take their place; but there is no record that they cared for them. The richer and more fantastic carvings of Grinling Gibbons had never obtained any general recognition nor availed to modify the woodwork of the domestic interiors of England. The brocades and flowered silks which the eighteenth century had revelled in, and if in England not strong enough artistically to produce them itself, had brought into England from other lands; — these were replaced by the dismal

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things I have alluded to, and no vestige of them seems to have remained in the parlors of that unhappy time.

Richness of costume had disappeared with the wars of the French Revolution. Embroidered silk coats had given place gradually to claret-colored and blue broadcloth, and this gave place to black, and all variety in costume had disappeared completely; and now, from 1810 to 1850, fantastically varied and interesting house-furnishing and decoration had followed, as I suppose it inevitably must follow; costume, being, one fears, a necessary part of anything like a prosperous artistic epoch.

Out of this gloomy depression the Anglo-Saxon world, in England and in this country, is trying to emerge. It began its efforts with the perfectly natural conviction that by studying the artistic history of the past, something could be done to benefit the arts of the present. The Gothic revival, which you have heard of so much, and which was followed with real ardor and with unquestioning zeal by crowds of devotees for years, beginning with, perhaps, 1840, was an attempt along the most obvious lines, — along what seemed to be the line of least resistance, to change the metaphor. To develop anew an old art, which had flourished so greatly in the past, — how easy! and how certain! How certain were the enthusiasts of that time, that by earnestly poring over and closely analyzing and heartily loving the buildings of the thirteenth and fourteenth centuries, such buildings, and others like them, could be built in the nineteenth! How happy was the conviction of all these men that it was not more difficult than that! The secret of what had been done was to be found in the phenomena themselves. There, in this parish church, in this cathedral, lay the secret of their charm. Let us analyze first, they said, and let us put together again the ingredients that our analysis shall have discovered, and we will re-create the thing that we are in search of.

In like manner, in the minor arts, the people of 1850 felt, or some of them did, that they did not know how to weave curtains that it was worth any one's while to hang up, except to shut out the light and shut in the warmth; that so far as beauty of texture, beauty of pattern, and beauty of color went, they were powerless to produce anything of any avail. But they saw that the Venetians of the sixteenth century and the Florentines of the seventeenth century and the French of the eighteenth century had produced splendid stuffs; and although there were no museums in those days that condescended to anything so humble, such stuffs were still to be bought of the bric-à-brac dealers, and very cheap, too, and still existed, rolled up in some old garrets. By studying them, surely the art of making others like them could be learned. And so around the whole circle of the arts of decoration, it was believed, and in thoroughly good faith, and with, as it seemed, perfectly good reason, that the study of what had been would suffice, with zeal and patience and good will, to the production of what should be.

Well, the experiment has failed. Archæology is the most delightful of pursuits, but it is not particularly conducive of good art. The German professor, who knows the most about Phidian sculpture, is as far as his youngest pupil from being able to produce anything Phidian, but, of course, this is not a fair example. The German professor does not profess to be a sculptor. Let us say then, that that sculptor now alive who knows the most, theoretically and historically about Greek art, is as far as his most ignorant contemporary and rival from having Greek methods of work. This is a safe proposition. I do not know who he is, nor can any one tell me. It is not a question of men, but of principles. The study of the monuments of art is one thing, their analysis, their criticism, their comparison, is one of the most attractive, the most fascinating, the most stimulating, the most absorbing of studies, one that I shall never cease commending in the most earnest way to all those persons to whom scholorship is dear and to whom it is a question of recommending a study which is worthy of their most earnest and hearty devotion, but it is not the study of practical art, that is another and a very different thing.

The way to make good sculpture is to let the youth thumb and punch and dabble in wet clay, and see what he can make of it; and the way to make a painter is to give the boy now a burnt stick, and at another time a pin and a back of a looking-glass, and see what he can delineate with such materials as these and with all other materials with which a line can be drawn. To look at the world, and what it contains, and to try and render what is suggested to him, — that is the training for the artist, and it has more to do with our beloved study of archæology than if they were not concerned with the same subject. This, I say, has been proven. Sad experience, the waste of forty years of work, disappointment and despair, have taught some of our artists what others did not need to learn, — that the way to succeed was not through study of the past. The artist has no primary need of archæological knowledge; the archæologist has no need of any fact that the artist can furnish him with.

Suggestions; yes! Each side can furnish the other with suggestions in abundance, and suggestions which each can immediately profit by. An able artist, if a fellow of modesty and frank speech, can hardly talk without giving the student of the theory of art hints which the latter should study over at home before he sleeps upon them; for the secret of much that is vital and essential in his study is to be found in these hints; and on the other hand, I imagine that an artist would be better off, and have more play of mind, and readier and fresher conceptions, if he would now and then listen to what the student of old art has to tell him about what is to be observed in this or that monument of the past. But beyond that there is no connection between them. I will run two *ateliers* side by side, one for archæologists, and one for practical students of architecture and they need never mix.

This will be more readily admitted, perhaps, in the case of the arts of expression than in the case of arts of decoration and let us define these terms. If you will allow me, I will quote from an address delivered a year ago before the New York Architectural League. Any work of art whose object is to explain and express the thing represented, or to convey the artist's thought about the thing represented, is art of representation, or, if you please, art of expression, or if you please, expressional art. I offer these as nearly synonymous terms. But if, on the other hand, the work of art has for its object the adornment of a surface of any sort, as a weapon, a utensil, an article of costume, and if the natural objects represented or suggested are used only as suggestions to furnish pretty lines and pleasant tints, which lines and tints might have been after all represented apart from the object were man's mind more creative than it is, — that is art of decoration.

Now, architecture, you see, is primarily an industrial affair, a method of covering men in from the rain, and admitting light into their protected interiors, and of warming those interiors, and in a few rare cases of ventilating them, and in providing a variety of apartments, communications, and the like for the varied requirements of a complicated existence; and it need not put on any artistic character at all. But as architecture becomes a fine art, it is perforce one of the arts of decoration. It has nothing to do with the arts of expression. Mr. Ruskin and all his life work to the contrary, notwithstanding, the business of building is not to tell tales about the world and its contents, not to set forth the truths of botany or of zoology, or of humanity, or of theology. If zoological or botanical or human objects are introduced, or representations of them, it is not for the sake of information that can be given about these interesting things, nor for the sake of expressing the artist's mind about them, nor for the sake of saying anything whatever in regard to them. It is for the sake of making the building beautiful. When the Oxford Museum stood presenting to the street a flat-fronted wall, diversed with pointed arches, and carvers were set to work bands of rich sculpture around the windows; although Mr. Ruskin had a great deal to do with that edifice, and architects of his own choosing were in charge of it, and clever Irish workmen of his own approval were producing the interesting carvings of those archivolts and tympanums, in spite of all theories, the object aimed at and the object attained by that outlay of time and money and skill was the beautifying of the building, and this was achieved to an extent probably beyond what its planners proposed to themselves, for the effect of well-applied sculpture upon a building is beneficial to an extent that would never be believed by one who has not often watched the changes that can be wrought in this way. They who have said that the Gothic Cathedral is nothing but a work of associated sculpture are not far wrong, and to produce a lovely building, one would rather have the blankest malt-house or brewery in New York, and some good carvers set to work upon it, than to have the richest architectural achievement of our time, devoid as it is and must be of decorative sculpture. For to get decorative sculpture, you must have your sculptors; and they, you know, are wanting. Where are the men who will model capitals and panels in clay, with some sense of ornamental effect? We have the men who can make a copy in relief of an architect's drawings: but then the architect, even if he have the sense of ornamental effect, in the first place can never draw out, full size and with care, all the work required in a rich building, and, in second place, can never design sculptured form aright by mere drawings on the flat. The architects of New York and Brooklyn are employing to-day, I suppose, 3,000 draughtsmen, of which number two or three hundred at least are engaged most of the time in making large scale and full-size drawings of architectural detail, in which sculpture plays a large part. Well, we need as many modellers, who, either in architects' offices, or in stone-cutters' yards and terra-cotta works, shall be putting into tangible form the dreams and thoughts of the designer's brain. "As many," do I say? Once it is found that architectural sculpture can be got promptly and cheaply, and conveniently, it is not 200 modellers only that this big community around the big bridge will need; but architects will engage three or four or a dozen at a time, as they now engage draughtsmen when big jobs come in.

For so the relative success and power to-day of the arts of expression seem to assure us. When we come to look into the subject, we find that modern life, which finds its expression freely in prose and in verse, and to a slight extent in music, finds some expression also in those arts which deal with expression. It is perhaps not a great artistic epoch that we are living in, although, if some one were to rise by and by, and maintain that it was, I would not be sure that he was wrong. It is certainly a kind of novel and in many ways admirable art in the way of expression. Great thoughts have found expression almost worthy of them in painting, in sculpture, in etching, in wood-engravings, in color and in black-and-white; in the single costly work of art and in the easily multiplied and cheap productions of the press. It is true that in these the thoughts are not always worthy of the expression they receive. This is partly because we have nearly lost the desire of talking about our religious beliefs in line and color and modelled form, and that no other subject of equal universal interest has taken the place of the ancient, simple and popular theology.

Patriotism, as shown in scenes of battle and pictures of deeds of

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gallantry and self-sacrifice; poetry, as seen in pictures which suggest sweet thoughts of young love and of home affections and of childish grace; the love of wild nature, as seen in our school of landscape art, now nearly fifty years old and flourishing — none of these nor all of them together have quite replaced the priestly theology of the Middle Ages as a subject for art, for none are quite so universal or appeal quite so readily to the untutored eye and mind. And so the uniform is better painted than the soldier very often, and the outside of nature than her inward spirit, and the flesh of the baby or the golden hair of the girl better than the baby nature or the girl nature in each instance. But this is to be stated merely as a drawback from praise which would otherwise be too unmeasured and too universal. The world contains a vast amount of good art of very recent date, and every year adds to the amount. The worst thing that can be said of the time is that it should be capable of producing so incalculably great an amount of bad art at the same time; that the walls of the Paris *Salon* should be so hung with inferior work every year that the important pictures are lost in chaos; and that, while this is true of the *Salon*, it is true to an immeasurably greater degree of the Royal Academy, of the New York Academy and every other exhibition in the world, except where a selected few paintings hang on reserved walls.

And as for sculpture, that is to say expressional sculpture, it is even more true in this case that the poor works terribly outnumber the good ones, though this is less noticed and makes less impression on the public. Our English-speaking communities do not even think of sculpture as a thing to look to for any refined enjoyment. How far the labors of a dozen living men, all Frenchmen but two or three, may have sufficed during the past score of years to change the public mind in this matter, I am not ready to say; but, surely, it has not been the general thought that sculpture is anything more than an expensive and perfunctory way of doing one's duty to a great occasion or a great man. This, however, is temporary. The good sculpture exists and will be recognized. So much for expressional art.

But, as for the arts of decoration, once more, there is not so much to be said. As yet the way to subdue technicalities and enthrone design has not been discovered. The way to produce beautiful buildings is known to none. The way to produce good interior decoration, good furniture, good jewelry, beautiful stuffs, has only been seen by here and there one, and his lead no one will follow. The fact of his having done a fine thing, or of his doing fine things habitually, acts not as an attraction to others, but as a warning to them to keep off. Every artist strives to do, not as his neighbor has done, and better, but as his neighbor has not done. The potteries work no better, because of one pottery which turns out beautiful work. The wall-paper makers still copy slavishly from Europe and Japan, fortunately if they do not spoil in copying, in spite of the occasional production of a wall-paper which an artist has succeeded in. The carpet-weavers caricature Oriental designs by taking out of them all movement and spirit, while their best customers buy the original rugs. If some rich man were to make a museum of modern decorative art, from which he would carefully exclude all that which was not in some way fresh and intelligent, and if not good, at least promising, a room like this one would hold all his trophies, even though he should use his millions to ransack Europe and America. It is nobody's fault, least of all is it the architect's fault. For see what you expect of an architect. He must know about digging deep holes; and about sheath-piling, that he may retain the loose soil and keep it from smothering the workmen at the bottom of his excavation; and he must know the best machines to use for drilling rock and the best method for removing it; he must know about all the stones in the country and the best way of making concrete; he must be familiar with the thousand new inventions, and discriminate carefully and rightly between this range and that, and between this form of trap and the other, between a dozen different steam-heaters and twenty systems of ventilation; he must be prepared to give his owners exactly what they want in the way of windows and chimney-corners, of cupboards, shelves in available corners, and recesses to put away step-ladders and brooms. But observe that if he fails in any one of these things, he will fail in that which his owner really cares about; still more, if he fails in the economical administration of the funds allowed for the building, will he fail in that which the owner most cares about. Less beauty, less success in producing a novel, an original, a thoughtful, a purposeful design will hurt him but little, but insufficient care as to the circulation of hot-water will ruin him.

Now, no man can do all that, and still produce delicate and thoughtful designs. No man can be busy laying out work, superintending work, explaining to contractors and reasoning with employers, and still be producing delicate and thoughtful designs. An extraordinary fellow here and there may surprise us by what he does under such circumstances, but it will be but little and feeble in comparison with what he might do. The community must see its way to paying some to eschew plumbing and stick to design, if they mean to have any design. This has been done, indeed, in the matter of monumental-glass, and to a certain extent in wall-decoration by means of painting; but it must be done in what is more vital yet — in architectural sculpture of all sorts and all grades; of vegetable, animal and human subjects; in low relief, in high relief and in the round; in detached work and associated groups — or no architecture for us. I say, then, that as things are constituted, the architects are not particularly to blame for not having achieved much in the way of decorative art, either on the exteriors of their great buildings or in the beauty of their interiors. Not much to blame; but yet they are so far to blame as that no one else is to do this work if they do not. The architects and the artists who are associated with them in the work of supplying us with what we call decorative arts of all sorts, form the only class of the community to whom the rest of the community can look to for advancement in this direction. It is probable, then, that what such an associate has to do is twofold; or rather it has two things to do: One is to study the beautiful art of the past, and to study it patiently and lovingly, feeling confident of this that the interests of the pursuit grow more absorbing every day; and the other is to watch the arts of the present, and to keep an open and perspective mind with regard to them, feeling sure of this that they will grow more complex and interesting every day, and that now and again some chance of something good will appear, here and there, giving us great opportunities to help, if we are clever enough to perceive them.

The study of the arts of the past is more entrancing every day because we are so much better informed, because we are daily better informed about them. Archæology, having gone through a long apprenticeship, is doing wonders to-day; and, although ancient buildings are suffering from the accursed restorer, they are also more thoroughly known, more rightly judged, more sympathetically analyzed than ever before; while monuments other than buildings, those, that is, that are not open to the attacks of the restorer, are preserved in practical safety, and they also are minutely and honestly studied in a way of which our ancestors knew nothing. There is, therefore, more pleasure to be got out of the study of ancient art to-day than ever before, and that condition of things is a permanent one. Our children will have even better opportunities than we.

And, as for the arts of the present, the arts that are being produced around us, they are to be looked at as calmly and temperately; with, on the other hand, as little as possible of that provincial which makes cathedrals out of carpenters' Gothic churches, and, on the other hand, without carping, but with good-natured patience, with a feeling that if things are not very good, they can hardly be expected to be better; that we, in this country at least, are only half-civilized in the ways of cultivation, and we do uncommonly well for such babes as we are in literature and art. With patience then, and with impatience about nothing but this, that we deny ourselves the study of the great works of art of Europe and Asia by thirty per cent and forty per cent and sixty per cent duty, and deny to the author all proper remuneration for his work by the lack of common honesty. No other nation of European blood does these things. It is not a matter of politics. No protectionists so ardent in the Bismarck ranks as to propose to levy a tax on literature and science. No selfish grabber so small, even among peoples whom we consider less honest than we, who approves of stealing an author's books under color of the law. While we send to Washington Congressmen who keep such laws on the statute-books, our community is not "barbarous" so much as savage; for such acts are the acts of savages; that is, of men who have no reasonable motive for their acts, but act impulsively, like grown-up children.

And now, after this evening, let us return from theory and general principles, to practice and details, and see whether we can find out how it is that Indians combine color, how Japanese use natural form decoratively, how Chinamen make porcelain lovely and noble; how Greeks of old time have sculptured and Frenchmen have created Gothic architecture, and Italians have raised painting to the highest heaven of achievement. There is happiness, if study can give it. And for those to whom scholarship is less attractive than action and production, there is sculpture in small and large, in stone, marble, terra-cotta, wax, clay, plaster, bronze, iron, lead, gold and silver; there is inlay of all material and styles, from square tiles to minute glass tesseræ; there is painting with all known vehicles and of all sorts; the whole to be devoted to the beautifying of buildings in which we have to live and work and rest. There is a plenty to do for those who know how to begin.

To Protect Plate-glass in Building. — Passing along Dearborn Street, recently, I saw a crowd watching closely the placing in position of some enormous panes of glass in a handsome new building. The glass was the best French plate, and the workmen handled it as carefully as if it were worth something more than a week's wages. The task of putting it in place was no sooner completed than one of the workmen grabbed a pot of whiting and with a big brush daubed a lot of meaningless marks on it. I thought it about as silly a thing as a man could do, and with the usual reportorial curiosity asked the foreman why he allowed it. The answer was a crusher. "Why," said he, "we have to mark them in that way or they'd be smashed in no time." My look of amazement doubtless prompted him to further explanation, for he said: "You see, the workmen around a new building get in the custom of shoving lumber, etc., through the open sash before the glass is put in. They would continue to do it even after the glass is in if we didn't do something to attract their attention. That's the reason you always see new windows daubed with glaring white marks. Even if a careless workman does start to shove a stick of timber through a costly plate of glass he will stop short when his eye catches the danger sign. That white mark is just a signal which says, 'Look out; you'll break me if you are not careful.'" — *Chicago Journal.*

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THE STRUCTURE OF SANDSTONE.[1]

AS AFFECTING ARCHITECTURAL AND ENGINEERING WORKS.

THE native stones we Liverpool architects have at command are all sandstones belonging to the geological division called the Trias, or, in older phraseology, the "New Red Sandstone," which lies above the coal-measures. The term "New Red" was given to distinguish these rocks from the "Old Red," which lies below the Mountain Limestone, the lowest division of the carboniferous rocks. It is, perhaps, needless to remark that the "New Red" is not always red; sometimes it is yellow, at others, like some of the Storeton stone, white. These red rocks occupy a large part of Lancashire and Cheshire, and especially in the latter county give the characteristic scenery which distinguishes it. The escarpment of the Peckforton Hills of which Beeston Castle Hill is an outlier, and that at Malpas, farther south, gives rise to some very beautiful scenery; and again at Grinshill and Hawkstone, in Shropshire, we have a repetition of much the same kind of landscape. It will be necessary for my purpose to say briefly that these red rocks have been divided into the "Bunter" and "Keuper"; the lower division, the Bunter, occupying most of the ground about Liverpool; the upper, the Keuper, being more developed on the Cheshire side. All these sandstones are not fit for building purposes, and those that are so used differ considerably in their durability. It is my object in this short Paper to show upon what the perfection or imperfection of the various stones for building purposes depends — a matter of great moment to an architect or engineer who is desirous that his work should last.

Sandstones, or, in masons' language, "free-stones," from the freedom with which most of them are worked when freshly taken from the quarry, are plastic or sedimentary rocks. That is, they are composed of separate particles which have once existed as sand, like that we see on our own shores, or in the sand dunes of Hoylake or Crosby. Sandstones are usually more or less laminated, and are stronger to transverse stress at right angles to their natural bedding than in any other direction, a fact recognized in every architect's specification, which states "all stones must be laid on their natural bed," a direction that unfortunately sometimes begins and ends in the specification. The cause of the superior strength is not, however, generally understood.

I have devoted some considerable time to an investigation of the internal structure of sandstones, which I have communicated from time to time to various scientific societies and publications, and will now briefly explain it in a manner I judge will be most likely to interest architects and engineers. The particles or grains of which the rock is built up are of various forms and sizes, from a thoroughly rounded grain, almost like small shot, to a broken and jagged structure, and to others possessing crystalline faces. These grains, most of them possessing a longer axis, have been rolled backwards and forwards by the tides or by river-currents. The larger grains naturally lie on their sides when freshly deposited, with their axes in the plane of bedding; the smaller and more rounded particles naturally tend to occupy the interstices between the others, and in this way rude divisional planes or laminations are formed. Each layer forms a sort of course like coursed-rubble in a wall, and by the necessities of deposition a certain rude geometric arrangement results, by which the particles of the future rock overlap each other, and thereby gain what is known to architects as bond.

But, so far, this is only like "dry walling," the mass wants cementing together to make it solid. The cementing process happens in this way in our rocks, which are almost purely silicious: Water containing a minute quantity of carbonic acid in solution, which most rain-water does, especially when it comes into contact with decaying vegetation, has the power of dissolving silica to a slight extent. This is proved in various ways, and is shown in the fact that all river water contains more or less silica in solution.

The circulation of water through the sand deposit of which our rocks are made dissolves part of the grains, and the silica taken up is redeposited on others. I cannot explain the chemical reaction that produces this deposition, but that it takes place in the rock during some period of its history is certain. I exhibit a quartzite pebble taken from the Triassic sandstone at Stanlow Point, which, as can be easily seen, was at one time worn perfectly smooth by attrition and long-continued wear, for the quartzite is very hard. Upon this worn surface you will see spangles and facets which reflect the light, and on closer inspection it will be evident that they are crystals of quartz that have been deposited upon the surface of the worn pebble after it became finally enclosed in the rock.

A microscopic examination of the granules of the rock itself will show that many of them have had crystalline quartz deposited upon their surfaces, and in some cases rounded grains have in this way become almost perfect crystals.

An examination of the best sandstones for building purposes shows that they possess more of these crystalline particles than the inferior ones, and a good silicious sandstone shows its good quality by a fresh fracture sparkling in the sun. In addition to these crystalline deposits of silica I believe it exists also as a cement which binds the particles together when in contact.

It certainly is, however, with this secondary silica that the original sand has become a building stone, and the particles have become interlaced and bound together. Thus, in building parlance, the grains are the rubble of the wall, the currents the quarrymen, masons and laborers, and the silicious infiltration the mortar.

And now, when I am on the subject, I may point out that this hard and compact quartzite pebble was also once loose sand. The only difference between the sandstone in which it was imbedded and itself is that in the latter case the process of silicious deposit has gone further, so that all the interstices between the grains have been absolutely filled up with the cement.

It is not possible to see this clearly with the naked eye, but by the aid of a slice of the rock prepared for the microscope the granular structure of the quartzite is made perfectly plain. So much for the mechanical, chemical, and molecular structure of sandstone, all of which affect the strength and quality of the stone; but to architects there is another element of consequence, namely, the color. The rich red of our Triassic sandstones is due to a pellicle of peroxide of iron coating each of the grains. That this is merely surface coloring is shown by the fact that hydro-chloric acid will discharge the color and leave the grains translucent. Unfortunately the most brilliantly colored stone is not the most durable, and it so happens that these brilliant red sandstones are often composed of exceedingly rounded grains. Also some of the very red sandstone has an interfilling of a loose argillacious irony matter detrimental to the stone as a building stone. The most durable of the red sandstones are those having a paler or grayer hue, like those of Woolton, Everton, and Runcorn. This distinction of color was brought freshly to my mind a short time since in looking at the church of Llandyrnog, in the Vale of Clwyd, a few miles from Ruthin. Some of the dressings, quoins for instance, were of a very brilliant-colored red sandstone, and others of a pale gray or purple red. It struck me that these latter must be of Runcorn stone, which I was afterwards informed was the case. The very red stone was the natural stone of the Vale, originally used for dressings, which were replaced, on the restorations being made, with Runcorn stone. The original stone was æsthetically the best, but the introduced stone the best structurally. The old stone of Chester Cathedral was a very red Bunter sandstone, which decayed badly. It has been replaced in the restorations by Runcorn stone, which belongs to the Keuper division, which has caused the Geological Surveyors to say that the Keuper is a better building stone than the Bunter. In this case it is; but, on the other hand, the Bunter sandstones, or Pebble-beds, as they are called, near Liverpool, are often better than the Runcorn Keuper. The Runcorn building stone lies between two beds of very red loose rock, showing that it is is not its geological position, but its *structure*, that makes it a good durable stone.

It is a remarkable fact that most of the pebbles included in the red rocks are quartzites, or indurated silicious sandstones; and, as showing that their solidity and hardness are due only to a further continuance of the deposit of silica in the interstices, it has been proved that the purple quartzites are purple only by reason of the original coloration of the grains which have been enclosed between the original grains and the secondary silica. Yellow sandstone is colored also by iron, and I have frequently seen the red sandstone shading of to the yellow without any division whatever. The various shades and tints of sandstone are necessarily due to the coloration of the individual grains.

Most of you will, no doubt, have observed the sort of marbling or grain upon the stone of our old buildings, such as the Town-Hall, which I believe was obtained from quarries occupying the site of the

[1] Read before the Liverpool Architectural Society, on the 18th November, 1889, by Mr. T. Mellard Reade, F. S. G. S. *Fellow*, President of the Society, and printed in the *R. I. B. A. Journal.*

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St. James's Cemetery. This is due to what is called current bedding; that is to say, the grains have been arranged along oblique lines and curves instead of in parallel laminæ. This stone, which is geologically equivalent to the Storeton Stone, and of the same nature, has stood very well. Some of the Storeton Stone, if free from clay galls, although very soft when quarried, becomes hardened by exposure, and will stand the weather much better than a harder and more pretentious material.

The stone of Compton House is in a very good condition, although the mason told me such was the hurry in rebuilding that they could not stop to select the stone, and also that it is placed in all sorts of positions with respect to its quarry bed. Perhaps the circumstances that the stone is not in parallel laminæ may have something to do with its durability, notwithstanding this latter fact.

It would take a long Paper, and several evenings, to exhaust the subject even of our local stones. I may mention, however, that the quarries of Grinshill, between Shrewsbury and Hawkstone, yield a beautiful white sandstone, of a finer grain than Storeton, but of a similar quality.

Most of the public buildings of Shrewsbury are built of it, and I am informed that it was to some extent used in the Exchange buildings. The rocky substratum of a district can be well seen in its ancient buildings, for in old times carriage was so important an item that the old builders could not go far for their stone; hence we see that the old churches of part of Lancashire and most of Cheshire, and a large portion of Shropshire, are of red sandstone. Some of it has stood very well, while some has decayed into shapeless masses. There is a tendency to exfoliate parallel to the exposed or worked surface, in all stones, irrespective of the way of the bed, but more so where the stone is set up on edge, or at right angles, to its quarry bed. It is interesting and peculiar to see in some of the old buildings erected with pebbly sandstone how the white quartz pebbles stand out from the surface like *warts*. This is due to the greater indestructibility of the quartz pebbles, and the weathering away, or denudation, of the sandstone face.

Before leaving the subject of local sandstones it will be necessary to refer to one quality they have which is of excellent utility as regards the storage of water, but which is decidedly a disadvantage in building stone — that is, their porosity. I have proved by actual experiment that a cubic foot of Runcorn Stone will take up three quarts of water by capillarity, and that it is possible to make a syphon of solid sandstone which will empty a vessel of water into another vessel by capillarity alone.[1] This shows the absolute necessity of damp-proof courses, not only in the main walls of buildings of stone, but even in fence walls, for the continual sucking up of moisture from the earth, and its evaporation at the surface of the stone, make it rapidly decay. I think I could show you this fact in almost any stone building in Liverpool or elsewhere where the stone is in direct connection with the earth. It also shows the necessity of taking care that no stones go through the wall to the interior surface, and of precautions for backing up stone walls with less porous materials, or the introduction of a cavity. If you could suppose such a sandstone wall 40 feet long, 20 feet high, and 1 foot 6 inches thick fully saturated, it would hold almost a ton of water! Of course, it never would be fully saturated, because of the evaporation from the surfaces, but with a southwest aspect, and very wet weather, it might become half saturated. But what does evaporation mean? It means the loss of so much heat and the burning of so much coal to supply its place. From this it will be seen that a pure sandstone wall is a thing to be avoided.

The subject is so wide a one that I have felt compelled to restrict my remarks to local sandstones, but the general principles of structure apply to all sandstones alike.

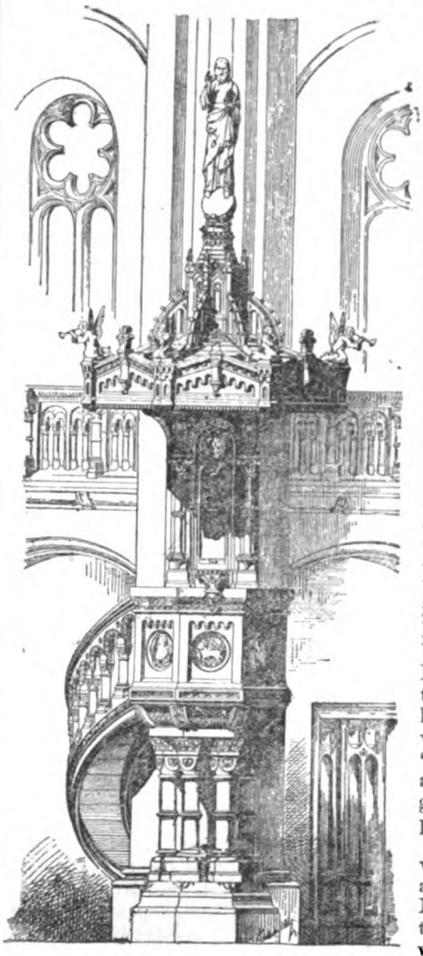
It is difficult by written description to tell you how to select a good stone, but one essential is that there shall be a good deposition of secondary quartz, as shown by the crystalline sparkling on the freshly fractured surface.

It must also be free from very decided laminations, for these constitute planes of weakness and are often indications of the deposition of varying materials, or the same material in various grades of fineness. It must also not be full of argillaceous and iron-oxide infillings. It should possess a homogeneous texture. The best way to study building stones is to study them in old buildings, for nature has then dissected their weaknesses.

Warfare on Oak Trees. — "The world seems to have waged a special warfare upon oak trees," says a St. Louis man. "Before iron ships were built, and that was only twelve years ago, oak was the only thing used. When this drain ceased oak came into demand for furniture, and it is almost as expensive now as black walnut. No one feels the growing scarcity of oak like the tanner, and the substitution of all sorts of chemical agencies leads up to the inquiry as to whether other vegetable products cannot be found to fill the place of oak bark. The wattle, a tree of Australian growth, has been found to contain from twenty-six to thirty per cent of tannic acid. Experiments have been made on the Pacific Slope, where the wattle readily grows, and in a bath of liquor, acid was made from it in forty-seven days, whereas in liquor made from Santa Cruz oak, the best to be found in all the Pacific States, the time required is from seventy-five to eighty days. The wattle will readily grow on the treeless plains of Texas, New Mexico and Arizona, the bark of which ought to yield five dollars per acre counting the fuel as nothing." — *Invention.*

[1] This experiment was made before the audience. — T. M. R.

THE BARYE EXHIBITION.



Entering the handsome galleries of the American Art Association, one finds the lower floor given up to the Barye bronzes, while the upper rooms are devoted to the "Angelus" and the paintings by Millet and other contemporaries of the great French sculptor. Passing on the left of the entrance the superb, large bronze of "Theseus battling with the Centaur," one is fronted by the great cast of the "Lion and Serpent," which from the centre of the gallery dominates the surrounding exhibits. Both of these are the property of the Metropolitan Museum of Art, the cast having lately been presented to that institution by the French government. Upon the right hangs Bonnat's vigorous portrait of Barye, on the left wall one sees the water-color of the "Tiger Hunt," and all around are cases, groups and isolated pieces of the bronzes.

Here are over 450 works in wax, plaster and bronze, of which Mr. W. T. Walters contributes one-fourth, while the Corcoran Gallery sends its entire collection, numbering nearly a hundred, Mr. Cyrus J. Lawrence loans sixty-two pieces, Mr. James F. Sutton fifty-two and Mr. Samuel P. Avery thirty. Other contributors, who have followed their generous example, are Messrs. R. Austin Robertson, Theodore K. Gibbs, Robert and Richard M. Hoe, James S. Inglis, Richard M. Hunt and Albert Spencer. Of many of the subjects there are several copies, and amateurs can study proofs and patinas to their heart's content. From Mr. Walters's famed collection are the four unique groups modelled for the table of the Duke of Orleans, chief of which is the "Tiger Hunt," where two of the huge cats attack an elephant from whose back three Indians defend themselves with courage. The giant pachyderm writhes his serpent-like trunk in air and plunges forward open-mouthed, trumpeting with pain from the keen claws of the tigers hanging on his flanks. The Hunts of the Bull, the Bear and the Elk are worthy companions of this magnificent bronze, offering wonderfully fine examples of condensed composition in the entwined bodies of men and beasts, and filling the eye with the grand sweeps of their circling forms. The same liberal patron of art also lends his unique piece of a walking lion, in silver, made in 1865 for a racing prize, and a plaster-proof of the little medallion of "Milo of Crotona attacked by a Lion," executed by Barye in 1819 for the Prix de Rome competition at the École des Beaux-Arts. This little gem, worthy of the antique, did not secure the prize, however, which went to a now-forgotten sculptor named Vatinelle. It had often been so before, it has often been so since down to our day (Comerre was preferred to Bastien Lepage in 1875) and doubtless it will be so for who knows how many years to come.

All the phases of that terrific struggle for existence where beast hunts beast, which have been depicted by Barye's genius, are here. Here is the "Tiger devouring a Crocodile" (with which Barye made his first appearance at the *Salon*, in 1831); the "Jaguar devouring a Hare"; the "Lion devouring a Doe," the "Crocodile devouring an Antelope," the "Python swallowing a Doe," the "Tiger devouring a Gazelle," the "Bear on a tree devouring an Owl" and the "Lion devouring a Boar." What a series of banquets on blood and warm, almost living flesh is here presented! How cruel these creatures are to each other, is the thought that first comes to us, but a second, reminds that it is but their instinct and a necessity of natural law, and repulsion is lost in astonishment and delight at the marvellous fidelity with which the sculptor has rendered these links in the great chain of animal life. Their (as we call it) savage eagerness, their almost blind rage for their appointed food, the tenacity with which they clutch and the ravening *anxiety* (caused by the dread of losing their prey) with which they tear the flesh of their victims, is por-

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trayed to the life. We speak of a death-grip, but here is a death and life grip — death to the victim whose palpitating body furnishes life to its destroyer. It is the hot-cold-bloodedness of nature, the disregard for suffering of the tornado, the earthquake and the avalanche, shown in little in the fangs and claws of these wild creatures. Then there are the battles of the more evenly-matched animals — not always as a result of the need of sustenance — such are the tiger transfixed by the elephant; the python's folds crushing the crocodile; and the bear dragging the bull to earth, or itself, in turn, overthrown by mastiffs. Then comes those groups into which man enters — the African horseman surprised by a great serpent whose formidable folds already enclose his struggling body; the Arabs killing a lion; and the "Theseus overcoming the Minotaur," wherein the calmly irresistible hero is about to bury his keen, short sword in the bull-neck of the gross monster. The success with which Barye has combined the human and bestial characteristics of the minotaur is most remarkable and a similar triumph is won in the hippogriff — the winged horse, with forefeet of claws and beaked nose, which leaps so swiftly over the coiled-shape of the dolphin-serpent, which serves for his pedestal — bearing upon his back the charming, nude figure of Angelica held in the mail-clad arms of Ariosto's hero. To this category *seems* to belong the "Ape riding a Gnu," the forms, however, being true to nature though appearing fantastic when placed in juxtaposition.

The horse as we know him, and carrying more familiar burdens, is shown in numerous equestrian statuettes, the best of which is the slender, nervous figure of Bonaparte as First Consul, mounted on a proudly-stepping Arab. There is another one of Napoleon, showing him at a later period of his life, and the other equestrian portraits include one of the Duke of Orleans, who looks every inch a gentleman; one of Gaston de Foix, the hero of Ravenna; and one of Charles VII. Then there is a spirited statuette of a Tartar warrior in chain armor sharply pulling back his steed, and a graceful figure of a lady wearing the riding-dress of 1830. A painful contrast is presented by the doomed horse unwillingly carrying a lion whose dreadful gripe his frantic rearing cannot loosen. In addition there are many studies of horses, various in breed and attitude, and the small wax model of a young man mastering a horse which though but a rough "first sketch" has all the "go and fire" possible. It would have been of interest if some illustration of Barye's equestrian monument of Napoleon at Ajaccio could have been shown, and this reminds me that except a photograph of the Château d'Eau at Marseilles, showing the four groups of animals designed by him (which Mr. Cyrus J. Lawrence was thoughtful enough to send), and the two reclining river-gods from the Louvre (sent by Mr. Walters), there is nothing which gives any idea of Barye's public work. Not even photographs of the War, Order, Glory and Peace groups of the Louvre, which could have easily been taken from the copies given by Mr. Walters to Baltimore, now on Mount Vernon Place, are present. But, in face of the admirable collection here gathered together, this may savor of ingratitude, and I will return to the consideration of the remaining sculptures.

Among them are some masterly pieces of decoration, the most important being the superb candelabra made for the Duc de Montpensier. These have seated at their base nude figures of the three chief goddesses of classic mythology, whose noble proportions and purity of outline prove the versatility and completeness of the sculptor's art. Juno is accompanied by her peacock and bears the rod of power; Minerva lifts a sword, and Venus holds the golden apple. The candelabra are further enriched with masks and chimeras, and bear at their top a charming circular group of the three graces, small undraped figures, with arms entwined and faces turned toward each other. The general design and exquisite detail of this work is worthy of the Renaissance. There are some more candlesticks and other works of decorative art, all of which bear the marks of a master-hand.

The humorous side of things is presented by some of the groups: in the ungainly figure of the elephant of Senegal running; in the bear lying on his back in a trough and eating with great gusto some sweet morsel which he holds between his paws; and in the meditative stork standing on the back of a turtle. Some of the animals are shown as sleeping or reclining, and there is a cat sitting, a goat feeding, a deer scratching its side and a pheasant walking, among others, but the tragic note is struck in most of them. Probably the best works are to be found among those pieces representing members of the feline race, which were always the subject of Barye's most thorough study. The sculptures of horses are also very numerous, and it strikes one at first as curious that, after all the rebuffs he received from the academic faction, who recognized no animals but the horse and lion as worthy of representation in sculpture, he should have modelled so many of these very creatures. But, after all, Barye's lions and horses belong to an entirely different race from those which the tradition-bound old fogies were pleased with. The collection embraces many admirable bronzes of birds: an eagle holding a dead heron; an owl with a rat; a paroquet on a tree, and a strikingly fine composition of a hawk killing a heron; and there are some beautiful studies of dogs, especially a large seated greyhound, belonging to Mr. Walters. There are rabbits, badgers, wolves and camels, but I remember no cows or pigs, and only one group of sheep. Wild life, much more than domestic, touched the sympathies of Barye.

Mr. Walters loans twenty-three of Barye's powerful water-colors of animals and a fine oil, of unusual size for this artist, of a tiger. One of the most striking of the water-colors shows a great snake swallowing an antelope, whose head is partly engulfed, and it is almost exactly the same as one of the bronzes from the Walters collection. Other gentlemen have contributed water-colors and oil-paintings by Barye, among them being several landscapes at Fontainebleau, and there are various etchings and prints after his works and some of his lithographs, pencil-sketches and autographs, with a copy of the only etching — a stag fighting a cougar — which, according to so good an authority as Mr. Avery, he ever made. These remarkable water-colors alone would suffice to show the genius of Barye, for they are full of the same qualities of truth and originality of expression which we see in his bronzes. Their color is exceedingly fine, and their topics are generally tigers, lions, elephants and serpents. It is a source of wonder how Barye, who never visited the East, could have so well depicted the tropical landscapes in which he has placed these tawny tigers and majestic lions. The drawings, like the sculptures, impress us with their air of absolute veracity, and, even in their most dramatic moments, suggest a reticence behind. Barye does not exhaust himself or his subject, yet he seems to have said the last word in this direction of art, and I cannot imagine that his profound and searching genius will ever be surpassed.

The managers of the galleries announce the exhibition of a hundred "masterpieces" by the contemporaries and friends of Barye, but I do not think that the visitor will find so large a number which can rightly be thus classed. To me it appears that something less than one-half are works of the first order, but among the remainder are many good things worthy of attention. Here again the treasures of Mr. Walters's collection are drawn upon and he sends some twenty-five pictures, prominent among which is the great "Martyrdom of St. Sebastian," by Corot; the "Evening Star," by the same master; Troyon's "Cattle Drinking"; Diaz's "Storm" and "Autumn Scene in the Forest of Fontainebleau"; Rousseau's "Le Givre"; Decamps's "Suicide"; Daubigny's large "Sunset on the Coast of France"; Delacroix's "Christ on the Cross"; and Millet's "Breaking Flax." One of the finest Millets I have ever seen is here, lent by Mr. Walters. This is the "Sheepfold at Night," which with several others of Mr. Walters's paintings here shown, was in the exhibition of "One Hundred Masterpieces" held at Paris in 1883. In its foreground a line of sheep pass by toward the gate of the fold through which some have already entered under the guidance of the shepherd and his dog, who stand near. The horizon is low, and just above it swings a swollen moon, shaped like a cup, from which floods of pale light fill the scene with color. If this were Mr. Walters's only contribution it would be sufficient to place us under a heavy obligation to him. The "St. Sebastian" is a large canvas, measuring four feet wide by eight feet high, which was first shown at the *Salon* of 1853, and afterwards twice received important changes at the artist's hands. It shows an opening in a great wood, with the saint reclining on the ground tended by two holy women, while above appear some angels who bear the martyr's palm and crown. Rousseau's "Le Givre" is well described by Sensier, who says in his "*Souvenirs sur Th. Rousseau*," it represents "the hills of Valmondois as seen a mile away across the Oise, along the des Forgets road. The composition could not be more simple. Little hillocks heaped in the foreground are covered with half-melted snow, and the sun, red in the midst of a leaden sky, is seen dying and threatening through the clouds." The "Suicide," of Decamps, shows the body of a young artist stretched lifeless on his pallet in a gloomy room, and is painted with extraordinary force. The "Sunset," by Daubigny, describes a scene on the French coast with some cows near a pool separated from the sea only by a few yards. The fore ground is rich in sombre greens and browns, the ocean a glorious blue and the sky tinged with the roses of sunset.

A superb specimen of the lately dead veteran, Jules Dupré, "The Old Oak," is lent by Mr. John G. Johnson, who contributes several other pictures, among them a fine "Going to the Fair," by Troyon, in which is seen a drove of cattle and sheep, with a woman on horseback behind talking to a man. Another still finer Troyon, the "Drove of Cattle and Sheep," which brought $26,000 at the Spencer sale, is lent by Mr. Cornelius Vanderbilt. It will be recalled as showing a flock of sheep coming along a road toward the spectator, while behind are two cows, one with head uplifted to avoid the threatening stick of the drover — a dumb but eloquent protest against man's cruelty. Corot's lovely "Lake Nemi," the property of Mr. Thomas Newcombe, is here, while Mr. Jay Gould sends his "Evening"; Mr. William F. Slater, of Norwich, Conn., the "Fauns and Nymphs," and Mr. Charles A. Dana his beautiful "Dance of Loves." To the same gentleman the public is indebted for an opportunity to admire Millet's admirable "Turkey-keeper." Mr. D. C. Lyall has Delacroix's splendid page of romance, "The Abduction of Rebecca," and among the numerous paintings which come from Mr. George I. Seney's gallery, is the same artist's well-known "Convulsionaries," a crowd of self-tortured fanatics wildly rushing through the white-walled streets of Tangiers. There are several other works by Delacroix, including examples of his vivid renditions of lions and tigers, and Mr. Slater has here his "Christopher Columbus," Mr. Potter Palmer, of Chicago, lending the "Giaour and Pacha." Gericault is represented by but one picture, a noble couchant lion, but in addition to the "Suicide," there are several other Decamps, notably the magnificently colored "Turkish

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Butcher's Shop," which, with a splendid Rousseau, the "Forest of Fontainebleau," comes from the collection of Mr. Henry Graves. The gorgeous blues and crimsons of Diaz's "Coronation of Love," which Mr. Brayton Ives is fortunate enough to own, glow in a corner of one of the galleries — a bouquet of living color. It was pleasant to meet again a familiar picture in Millet's "Waiting," which the writer recalls often seeing at the Boston Art Museum when it belonged to Mr. Henry Sayles. It is now the property of Mr. Seney, and will be at once remembered by any who have ever seen its homely but touching figures of the old mother looking down the road for the coming of her absent son, and the blind father stumbling hastily over the steps to the door. I renewed my acquaintance with the inimitable cat which arches its back, elevates its tail and miaows on the bench outside, its ginger-colored coat relieved against the cool blue-grays of the stone wall. It is the apocryphal story of Tobit and Anna, with the waiting parents made into peasants of Millet's own country, and when it was exhibited at the *Salon* of 1861, the public, of course, passed it by to gaze at the "Phryne" of Gérôme. Millet has doubtless painted better pictures, but for direct simple pathos it would be hard to surpass this.

Boston, through Mr. Quincy Shaw and other gentlemen, sends to the exhibition some of the best paintings shown. Mr. Shaw exhibits his "Potato-planters," to me the most beautiful in its rosy tones of any example of the artist here; of the same size, a fine "End of the Village of Greville," walled with graystone, its little street monopolized by geese and ducks, and the sea-gulls flying above; and the "Buckwheat Threshers," with two smaller canvases. Mr. F. L. Ames, lends two Millets, a beautiful Rousseau, "The Valley of Tiffauge," Decamps's splendid picture of an African about to sling a stone at a vulture sitting on some ruins, and the superbly painted dogs of Troyon's "Gardechasse." Dr. H. C. Angell's fine Jules Dupré, "Symphony," is also here.

The Millets number about a third of the paintings and among them is an interesting variation of the "Sower," narrower in shape than the others and with a steeper hillside. It would have been a delight to have seen Mr. Shaw's "Sower" temporarily lifted from its place in the modest house which conceals so many treasures, and brought here, especially as it was not possible to borrow the replica belonging to the estate of the late W. H. Vanderbilt, but such good fortune was not in store for us. A beautiful little nude by Millet, "After the Bath," has been sent by Mr. A. C. Clark. I think it must be the same one which was at the Bartholdi Pedestal Fund Exhibition some years ago, when it belonged to Mr. Erwin Davis. Messrs. Boussod, Valadon & Co., have lent an important and beautiful "November" by Millet, showing a sloping field with a harrow lying on the foreground and a man shooting at a flock of birds from behind a tree at the top of the hill.

The "Angelus," draped with crimson, is given the entire end of the long upper gallery and, I think, proves a disappointment to most, if not all. One chief reason for this is its small size, — it is but about 21 x 25 inches — and then it is certainly not to be compared for painting with half a dozen other Millets which are here. Its sentiment is lasting, however, but it is not new to us, on the contrary it is a household word now, and the painting gives but little more than does Waltner's etching. Mr. Walters loans the crayon sketch for it and one of "The Sower" and the "Sheepfold by Moonlight," with others, and there are some very interesting pastels and water-colors by Millet, Rousseau and Delacroix.

Altogether the exhibition is an extraordinarily good one, unapproached as to the Baryes and not easily surpassable as to the paintings of the Fontainebleau school, and any lover of art would find himself amply repaid by it for a journey to New York.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

"THE LION AND THE SERPENT." M. A. L. BARYE, SCULPTOR.

[Photogravure issued only with the International Edition.]

See article elsewhere in this issue.

AUDITORIUM OF THE PALACE OF THE TROCADERO, PARIS, FRANCE. MM. DAVIOUD & BORDAIS, ARCHITECTS.

[Gelatine Plate issued only with the International Edition.]

AN INTERIOR IN THE CHATEAU DE JOSSELIN, MORBIHAN, FRANCE.

[Gelatine Plate issued only with the International Edition.]

TORRE DEL VINO, ALHAMBRA, GRANADA, SPAIN.

[Grano-chrome issued only with the International Edition.]

RUINS OF THE CHAPEL OF CHARLES V, YUSTE, SPAIN.

[Grano-chrome issued only with the International Edition.]

COOMBE WARREN, KINGSTON, ENGLAND. — GARDEN FRONT. THE LATE MR. GEORGE DEVEY, ARCHITECT.

[Issued only with the International Edition.]

COOMBE WARREN, KINGSTON, ENGLAND. — ENTRANCE FRONT. THE LATE MR. GEORGE DEVEY, ARCHITECT.

[Issued only with the International Edition.]

A GENTLEMAN'S COUNTRY HOUSE. MR. HORACE R. APPELBEE, ARCHITECT.

[Issued only with the International Edition.]

THIS design is founded upon the Francis I style of architecture, though it by no means slavishly follows it. It was required to obtain a house suited in all respects to modern requirements, including such things as sash-windows, and in places plate-glass. These hardly harmonize with the ordinary character of English country-houses of the Elizabethan and Queen Anne types, with their many mullioned windows and lead-glazed casements, nor is the other extreme of heavy Classic with ponderous detail and a portico two stories high at all desirable. The style of Francis I offers a mean between these, giving emphasis to the principal block by a certain amount of symmetrical planning, together with picturesqueness, with rich and refined detail, which a gentleman's country-house certainly requires. The exterior would be of long and thin red bricks, with stone cornices and other dressings, and roofed with green slates. The interior has oak-work and enriched plaster ceilings to the principal rooms, with the exception of the hall, where the ceiling would be of oak. The hall and the staircase would have some stained-glass in the windows. The original drawing was exhibited in this year's Academy.

WROUGHT-IRON GATES, DUKE STREET, CHELMSFORD, ENGLAND.

[Issued only with the International Edition.]

HISTORICAL FIGURES FROM LORD MAYOR'S PROCESSION, 1889. DESIGNED BY MR. JOHN JELLICOE.

[Issued only with the International Edition.]

THESE figure sketches embrace five typical examples from the late Lord Mayor's show, in which Mediæval, Tudor and Stuart costumes were (thanks to the research and artistic knowledge of Hon. Lewis Wingfield) so pleasantly associated. We have selected five, both on account of their diversity and also because of their being representative costumes of different eras in English history. The dresses, for magnificence and accuracy of detail, have rarely been equalled.

HOUSE OF MRS. CHARLES BLAKE, BEACON ST., BOSTON, MASS. MESSRS. STURGIS & CABOT, ARCHITECTS, BOSTON, MASS.

[Issued only with the Imperial and International Editions.]

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MR. GLENN BROWN, ARCHITECT, WASHINGTON, D. C.

ALTHOUGH the selection of material is a matter that can be well dispensed with until the general design has been determined, the architect suggests as in harmony with the treatment, Westerly, R. I. granite for the body of the cathedral, with trimmings of carved capitals, bases, columns, belts, arches and other ornamental stonework of a Georgia marble. The granite is cream color, with a suspicion of red, and the marble is of the same shade but a trifle darker and more positive. Both from chemical and physical tests they are apparently of equal strength and durability. The colors suggested would not give the building the cold appearance of white marble, or the somewhat sombre appearance produced by gray granite.

The stones are to be laid in square blocks, regular courses and rock-face in the body of the building, with square and sharp corners. The columns, lintels, sills, belts, finials and mouldings are to be close hammered work, with carving where indicated on the drawings.

The different tower roofs are to be fine-hammered or rubbed granite. The distinction between the tower roofs and the body of the building is not brought out clearly in the different drawings, as this would require shading all the granite stonework except the tower roofs, and shading is prohibited by the instructions.

The interior of the church is designed to be finished in marbles of harmonious colors, with carved and other decorated work, as shown in the section. The surface of the floor is to be laid in mosaic tile, the presumption being that fixed pews will not be used in the cathedral. Ample storage can be obtained for portable seats in the cellar.

The floors are laid on terra-cotta arches, built on iron beams, and the beams are protected by terra-cotta casings.

The roof of the building is to be covered with slate [preferably red], laid on terra-cotta and supported by iron trusses and beams; the iron-work to be protected by a fireproof covering. The tower roofs contemplate granite, lapped and jointed so as to be weather-proof, laid on iron beams and supported by iron trusses. If a cheaper covering is desired, slate or tile can be used without affecting the design.

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The ceiling is a barrel-vault with large and small arched ribs pierced in each bay by the small vaults in which the clerestory windows open. It may be treated in one of three ways: first, finished in marble; second, marble ribs, the larger surfaces being terra-cotta blocks covered with mosaic tile; third, the larger surfaces frescoed on plaster. The ceiling of the lantern in the centre of the cathedral will be supported by arch trusses, and show metallic ribs on the interior, glazed with cathedral glass.

The screens between the choir and aisles and between the aisle and vestries and chapels are intended to be of wrought-iron, bronze or brass, or a combination. They should be arranged so as to slide down into the cellar and leave the entire building open and unobstructed whenever it might be thought desirable.

The outside doors are to be bronze, with figures on them in low relief.

The size of columns and piers, and the weights imposed upon them, the thrusts of arches and trusses, their proper abutments and ties and other constructional problems have been calculated with a sufficient degree of accuracy to determine the feasibility of the execution of the design according to the drawings.

In the lantern where the frescoing is contemplated the wall will be faced with porous brick, on which the proper fresco plaster can be spread.

The plan is arranged to facilitate the ingress and egress of large assemblages of people, five doorways being provided in the nave entrance and two in each of the transepts. The galleries over the nave and transept vestibules and the triforium have stairways with entrances on the side porches. Including the clergy entrances, fifteen outside doors are planned. The vestibules and porches connect with each other so that worshippers can pass from one to the other under cover.

The arrangement adopted for the central tower allows a central auditorium about one hundred feet in diameter, unobstructed by columns or piers, with the nave transepts and choir opening into it. The aisles are not decreased by this central enlargement, as they deflect through the four abutting towers.

The different vestry-rooms, library or sacristy and the treasury are grouped conveniently to the choir, with separate entrances for the church officials. The meeting-room for the clergy or chapter and the chapel have entrances independent of the church, or by lowering the screen they can be thrown open into the cathedral. Toilet-rooms, custodian's and a committee-room are located on the transept vestibules, as these entrances would most probably be constantly open.

Elevators are placed in two of the supplemental towers, and stairways in the ones adjoining the choir, landing visitors on the triforium gallery, which encircles the building, and in the two galleries which encircle the central lantern. From the lantern galleries visitors can obtain fine interior views of the building, and comprehend the crucial form of the plan at a glance.

TABULATIONS OF APPROXIMATE DIMENSIONS.

	Length.	Breadth.	Height.	Square feet.
Ground-floor including walls height to the ridge of roof.....	400	156 to 230	148	69,000
Lantern or central tower exterior	106	106	400	11,236
Nave interior	125	50	100	6,250
Transepts interior	30	50	100	3,000 for the two
Choir interior.....	95	50	100	4,750
Central tower interior..	88	88	200	
Aisles interior.....		16	40	
Chapel and Chapter....	52	26		
Square feet of auditorium exclusive of aisles, columns and space between columns, triforium and galleries ..				20,486
Auditorium including everything except choir.....				48,106

✓ ABBEY OF ABERBROTHWICK: GALLERY OVER ENTRANCE.

✓ ABBEY OF ABERBROTHWICK: THE WESTERN DOORWAY.

THE traveller by sea, along the east coast of Scotland, is liable to be reminded with startling emphasis of the demolition to which the ecclesiastical architecture of the country has been subjected. Leaving behind him on his northward course the fragments of the metropolitan Cathedral of St. Andrews, he crosses a wide arm of the sea, and when he again approaches the shore, the objects most prominent against the sky are the still more disastrously shattered remnants of the great Abbey of Aberbrothwick. One lofty fragment presents in its centre a circle, doubtless once filled with richly moulded mullions and stained-glass, but through which the blue sky is now visible. This vacant circle is the only symmetrical form in these lofty masses that at a distance strikes the eye — all else is shapeless and fragmentary. Around these huge unsightly vestiges of ancient magnificence the types of modern comfort and commercial wealth cluster thickly, in the shape of a small but busy manufacturing town, with its mills, tall chimneys and rows of substantial houses.

The ruins, which are interesting only in their details, scarcely present a more inviting general aspect as they are approached. Nearing them from the High Street of the burgh, the first prominent object is a grim, strong, square tower, the sole remaining complete edifice of the great establishment, now used as a butcher's shop. It was not perhaps without design that this formidable building was so placed as to frown over the dwellings of the industrious burghers — it was the prison of the regality of the abbey — the place of punishment or detention through which a judicial power, scarcely inferior to that of the royal courts, was enforced by this potent brotherhood; and thus it served to remind the world without, that the coercive power of the abbot and his chapter was scarcely inferior to their spiritual dignity and their temporal magnificence. Passing onward, the whole scene is found to be a chaos of ruin. Fragments of the church, with those of the cloisters and other monastic edifices, rise in apparently inseparable confusion from the grassy ground; but, with a little observation, the cruciform outline of the church can be traced, and then its disjointed masses reduce themselves into connected details. The dark-red stone of which the building was constructed is friable, and peculiarly apt to crumble under the moist atmosphere and dreary winds of the northeast coast. The mouldings and tracery are thus wofully obliterated, and the facings are so much decayed as to leave the original surface distinguishable only here and there. At comparatively late periods large masses of the ruins have fallen down; and Pennant mentions such an event as having taken place just before he visited the spot. This palpable progress towards the complete extinction of the relics of one of the finest Gothic buildings in Scotland, certainly rendered it not only justifiable but highly praiseworthy that the Exchequer should make some effort for preserving so much of the pile as was preservable. Restoration was not to be expected — the preservation of the existing fragments was all that could be reasonably looked for. It must be confessed, however, that the operations, by means of which this service was accomplished, have given no picturesque aid to the mass of ruins, but have rather introduced a new element of discordance and confusion, in the contrast between the cold, flat, new surfaces of masonry and the rugged, weatherbeaten ruins in which they are embodied.

There are few buildings in which the Norman and the early English are so closely blended, and the transition so gentle. The great western door has the Norman arch, with an approach to the later types in some of its rather peculiar mouldings, while the broad and equally peculiar gallery above it — the only interior portion of the church remaining in a state of preservation — shows the pointed arch, with all the simplicity of the Norman pillar and capital. All the material fragments of the church now remaining are represented in the four accompanying plates, from which as full an idea of the shape and character of the remains may be derived as the visitor could acquire on the spot. It will be seen that over the gallery, at the western end of the nave, there widens the lower arc of a circular window, which must have been of great size. The only portions of the aisle windows still existing are on the south side of the nave. None of the central pillars remain, but their bases have been carefully laid bare: and it is supposed, from the greater size of those at the meeting of the cross, that here there had been a great central tower.

Among the tombs of more modern date, in the grave-yard near the church, there are many which bear sculptural marks of a very remote antiquity; and among the ornaments they present, the primitive form of the cross is conspicuous. During the operations for cleaning out the ruins, which were conducted under the authority of the Exchequer in 1815,[1] some pieces of monumental sculpture were discovered, two of which are curious and remarkable. The one is the mutilated figure of a dignified churchman — probably an abbot. The head, the hands — which appear to have been clasped — and the feet, are broken off and lost; but the fragment thus truncated has much appearance of grace in the folds of the drapery and the disposition of the limbs, while a series of rich ceremonial ornaments appear to have been brought out with great force and minuteness. The other figure, still more mutilated, is simpler in the ordinary details, but has attached to it some adjuncts which have perplexed the learned. The feet appear to have rested on the effigy of a beast, the remains of which indicate it to have represented a lion. It has, from this circumstance, been inferred that the statue was that of William the Lion, the founder of the abbey. The figure has, however, been attired in flowing robes, and a purse hangs from the girdle. But the portions of this fragment which chiefly contributed to rouse curiosity, are some incrustations, which had at first the appearance of the effigies of lizards crawling along the main figure. It was supposed that these reptiles were intended to embody the idea of malevolent spirits, and that the piece of sculpture might have been designed to represent a myth, probably in reference to the machinations of the infernal world. But, upon a closer inspection, it was found that these tiny figures represented pigmy knights in armor, scrambling, as it were, up the massive figure. One appears to be struggling with the drapery below; another has reached the waist; and the fracture, which is across the shoulder, leaves dangling the mailed heels of two others, which must have reached the neck. Is it possible that there can be here any reference to the slaughter of Becket, to whom the abbey was dedicated?

HISTORICAL SKETCH.

The historical circumstances connected with the foundation of this monastic institution are remarkable. It was founded and endowed by William the Lion, King of Scots, in the year 1178, and dedicated

[1] New Stat. Account, Forfar, p. 80.

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to St. Thomas à Becket, the martyr of the principle of ecclesiastical supremacy, whose slaughter at the high altar of Canterbury Cathedral occurred in 1170, and who was canonized in 1173. This great establishment, richly endowed, was thus a magnificent piece of homage by the Scottish King to a principle which, especially under the bold and uncompromising guidance of its great advocate, had solely perplexed and baffled his royal neighbor on the English throne, and boded future trouble and humiliation to all thrones and temporal dignities. Much antiquarian speculation has been exerted, but without very obvious success, to fathom the motives for this act of munificence. William had invaded those parts of the north of England which were previously held in a species of feudality by the Kings of Scotland, and was disgracefully defeated at Alnwick, and committed to captivity, just at the time when the English monarch, whose forces accomplished the victory and capture, was enduring his humiliating penance at the tomb of the canonized archbishop. Lord Hailes, who says that "William was personally acquainted with Becket, when there was little probability of his ever becoming a confessor, martyr and saint," endeavoring to discover a motive for the munificence of the Scottish King, continues to say: "Perhaps it was meant as a public declaration that he did not ascribe his disaster at Alnwick to the ill-will of his old friend. He may, perhaps, have been hurried by the torrent of popular prejudices into the belief that his disaster proceeded from the partiality of Becket towards the penitent Henry; and he might imagine that if equal honors were done in Scotland to the new saint as in England he might, on future occasions, observe a neutrality."[1] It is remarkable that several of the early chroniclers allude to this friendship between the Scottish monarch, who was a resolute champion of temporal authority, and the representative of ecclesiastical supremacy. . . .

Princes may be induced, by personal circumstances, to change their views, and in the times when they were not controlled by responsible ministers, they gave effect to their alterations of opinion. It is quite possible that at the time when he founded the Abbey, William was partial to Church ascendency, for his celebrated contest with the ecclesiastical power arose out of subsequent events. This King's disputes with the Church have a somewhat complex shape. The clergy of his own dominions had a spiritual war against the English hierarchy, who asserted a claim to exercise metropolitan authority over them; and it might have been supposed that William, if he sought to humble his own clergy, would have found it politic to favor the pretensions of those of England. But the interests of the two clerical bodies became in the end united. Thus the war which had so long raged in England, passed towards the north, with this difference, that the King of Scots had to encounter not only his own native hierarchy, but the victorious Church of England, just elated by its triumph over Henry. The Chapter of St. Andrews had elected a person to be their bishop, not acceptable to William, who desired to give the chair to his own chaplain. The King seized the temporalities, and prevailed on the other bishops to countenance his favorite. The bishop-elect appealed to Rome. Pope Alexander III issued legatine powers over Scotland to the Archbishop of York, who, along with the Bishop of Durham, after an ineffectual war of minor threats and inflictions, excommunicated the King, and laid the kingdom under interdict. At this point Alexander III died, and the new pope thought it wise to make concessions to an uncompromising adversary in a rude and distant land, who had shown himself possessed of an extent of temporal power sufficient to counteract the power of Rome, even among the ecclesiastics themselves.

It was before this great feud commenced that the Abbey was founded; but during its continuance the institution received, from whatever motives, many tokens of royal favor, as well as precious gifts from the great barons. Among the list of benefactors we find many of those old Norman names, which cease to be associated with Scottish history after the War of Independence. It is a still more striking instance of the community of interest between the two kingdoms anterior to this war, that while we find a Scottish king devoting a great monastic establishment to the memory of an English prelate, we should find an English king conferring special privileges and immunities within his realm on the Scottish brotherhood. . . .

The Abbey was founded for Tyronesian monks, and the parent stock whence it received its first inmates was the old Abbey of Kelso. In the year of the foundation, Reginald, elected "Abbot of the Church of St. Thomas," was, with his convent, released of all subjection and obedience to the abbot and convent of Kelso. The church was completed and consecrated under the abbacy of Ralph de Lamley, in 1233. Aberbrothwick was one of those ecclesiastical institutions immediately connected with the spread of the Roman hierarchy, which gradually sucked up the curious pristine establishment of the Culdees; and the muniments of the Abbey thus afford some traces of the character and history of this religious body, at least towards the period of their extinction. Thus, while the Church of Abernethy, an ancient seat of the Culdees, is granted by King William to his new foundation, Orme of Abernethy, who is also styled Abbot of Abernethy, grants the half of the tithes of the property of himself and his heirs, the other half of which belongs to the Culdees of Abernethy, while some disposals of a strictly ecclesiastical character are made by the same document. Thus we find an abbot who makes disposal for his heirs — a counterpart to those references to the legitimate progeny of churchmen, which frequently puzzle the antiquary in his researches through early Scottish ecclesiastical history.

The Abbot of Aberbrothwick possessed a peculiar privilege, the origin of which is in some measure associated with the Culdees — the custody of the Brecbennach, or consecrated banner of St. Columba. The lands of Forglen, the church of which was dedicated to Adomnan the biographer of Columba, were gifted for the maintenance of the banner. The privilege was conferred on the Abbey by King William, but as it inferred the warlike service of following the banner to the King's host, the actual custody was held by laymen, the Abbey enjoying the pecuniary advantages attached to the privilege, as religious houses drew the temporalities of churches served by vicars.

It will readily be believed that this, one of the richest and most magnificent monastic institutions in Scotland, numbered many eminent men among its abbots, who from time to time connect it with the early history of Scotland. It is even associated with a literature that has survived to the present day, in having been presided over by Gavin Douglas, the translator of Virgil. The two Beatons, Cardinal David and Archbishop James, also successively its abbots, give it a more ambiguous reputation. At the Reformation, the wealth of the Abbey was converted into a temporal lordship, in favor of Lord Claude Hamilton, third son of the Duke of Chatelherault, and the greater part of the temporalities came, in the seventeenth century, into the hands of the Panmure family.

In a tradition immortalized by a fine ballad of Southey's, it is said that the abbots of Aberbrothwick, in their munificent humanity preserved a beacon on that dangerous reef of rock in the German Ocean, which is supposed to have received its name of the "Bell Rock" from the peculiar character of the warning machinery of which the abbot made use:

"The Abbot of Aberbrothwick
Had placed that bell on the Inchcape rock,
On a buoy in the storm it floated and swung,
And over the waves its warning rung.

"When the rock was hid by the surge's swell,
The mariners heard the warning bell;
And then they knew the perilous rock,
And bless'd the Abbot of Aberbrothwick."

The tradition represents a rover, in the recklessness of prosperity and sunshine, cutting the bell-rope, and afterwards returning in foul weather to be shipwrecked on the rock from which he had impiously removed the warning beacon. No evidence of the existence of the bell is found in the records of the Abbey; and on the subject of its wanton removal, the sagacious engineer of the Northern Lights say, "It in no measure accords with the respect and veneration entertained by seamen of all classes for landmarks; more especially as there seems to be no difficulty in accounting for the disappearance of such an apparatus, unprotected, as it must have been, from the raging element of the sea."[2]

DESIGN FOR A STORE. MESSRS. WAIT & CUTTER, ARCHITECTS, BOSTON, MASS.

SOCIETIES

BOSTON SOCIETY OF ARCHITECTS.

Recommendations by the Boston Society of Architects, in regard to practice in obtaining estimates from contractors:

1. Drawings, when offered for final or competitive estimates, should be sufficient in number and character to represent the proposed works clearly; should be at a scale of not less than one-eighth of an inch to the foot, and be rendered in ink or some permanent process.

2. Proper details should be furnished for work that is not otherwise sufficiently described for estimate.

3. Specifications should be in ink. They should be definite where not sufficiently defined and explained by drawings, and every distinctive class of work to be included in contract should be mentioned and placed under its appropriate heading.

4. Contractors should be notified, at time of estimate, if they are to be restricted in the employment of their subcontractors.

5. Sub-bids received by architects should be held as confidential communications until all the estimates in a given class of work have been submitted.

The principal contractor should add to his bids all these subestimates while in the architect's office, and should sign a tender in which the names of these above-mentioned subcontractors should be enumerated.

6. A subcontractor should not (without his free consent) be placed under a general contractor, and no general contractor should be compelled to accept (without his free consent) the estimate of any subcontractor.

7. Should a contractor decline to assume in his contract the estimate for any work not included in his original estimate, he should

[1] Annals, 1178.

[2] Stevenson on the Bell Rock Light-house, 69.

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not thereby be denied the contract upon the portions of the work covered by his original estimate.

8. Estimates should not be binding more than thirty days after received.

9. Unless previous notification has been given to the contrary in the specification or otherwise, the lowest invited bidder is entitled to the contract. If radical changes are made, the whole competition should be reopened.

10. After bids have been received, and before the award, bidders should not be allowed to amend their estimates.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

BARYE'S ADMIRER.

NEW YORK, N. Y., December 28, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I have just seen a letter from "Anglo-American" in your issue of December 14, in which he calls for the name of the English artist who said concerning the French sculptor, Barye: "Had he been born in Great Britain, we would have had a group by Barye in every square in London."

Théophile Silvestre reports this remark as if uttered in his presence. He says (1856) that the speaker was Mr. Herbert, an artist of distinction. Probably this was Arthur J. Herbert. Your correspondent takes the remark perhaps too literally, when it merely meant to express admiration through a slight exaggeration. Mr. Herbert would have been content to see a few squares only decorated with groups by an English equivalent of Barye, had one existed.

As to the assertion by "Anglo-American" that Alfred Stevens was "an artist not inferior to Barye" it will be shared by few who have studied the works of the great French sculptor of animals and men.

"Anglo-American" is right in saying that my short paper in *Harper's Weekly* errs in giving two bronze groups after Barye to Mount Vernon Square, Baltimore, instead of four. Were I a resident of that city, I could hardly have known this better, and how the error got there puzzles me. Certainly had I been permitted to see a proof of that paper the mistake would have been corrected, unimportant as it is, so far as Barye is concerned. I must compliment your correspondent on the quickness of eye that detected the slip and regret that the proof-reader of *Harper's Weekly* did not know his Baltimore to the same degree. But he is himself in error when he speaks of the "*Life and Works of Antoine Louis Barye*," written by me and published by the Barye Monument Association as a catalogue. The catalogue is quite another thing from the *édition de luxe*, which is the only edition of the "*Life*." CHARLES DE KAY.

EVAPORATION OF WATER IN TRAPS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — In a late issue of your journal an advocate of Trap-venting, says of ordinary S-traps "If the traps are filled even once in two months they will keep their seals intact."

Most persons now agree that S-traps which are back-vented in the ordinary manner require refilling by hand as often as once a fortnight. It is, therefore, clear that the system of back-venting is a very dangerous one. Its original object was to afford security. It is now found (and strangely enough, even by its advocates) that it totally fails in this respect and that it requires an amount of attention which experience and common-sense show us it will never receive.

My experiments on the rate of seal-reduction through evaporation produced by back-venting were made with the greatest care and show a more rapid loss than is generally supposed. If the reports of these experiments are studied, it will be seen that every precaution was taken to secure trustworthy results. Although my experiments on siphonage were made during the same year and on the same system of piping with those on evaporation, it will be seen by studying the drawings and text of the report that the former in no wise interfered with the latter. No experiments on siphonage were made while the water stood high in the traps during the tests for evaporation, and no disturbance of the water seals was made by this or any other cause during the evaporation tests. It would have been exceedingly careless and totally unnecessary to allow of any such disturbance. Moreover, most of the experiments on evaporation were made, as shown, on a stack so connected with the rest of the system of piping that such disturbance would have been impossible. Even had we not so carefully closed the inlet or house-side of the traps.

I found that a warm flue caused the back-vent pipe to evaporate enough of the water from the seal of the trap to break it in less than a week, and I am confident that this often happens in practice.

How short-sighted and foolish is it to endeavor to throw discredit on these experiments which were made with the greatest care and honesty and which were witnessed and subscribed to by impartial experts, and to argue that, because other experiments made under different conditions showed a somewhat slower rate of evaporation, therefore cases could never occur in which the more rapid rate might be encountered in practice.

It is likely that the public will very soon awake to a sense of the importance of investigating this matter for themselves. Their Boards of Health will then find that with a very small outlay they can obtain the truth; and that a vast amount of unnecessary complication and expense can be saved in plumbing and, at the same time greater security be obtained.

When we consider, too, the well-known unreliability of the vent-pipe in other ways and the frequency with which it is found totally closed by grease, it becomes something more than folly to recommend the public to place implicit reliance upon it.

J. P. PUTNAM.

NOTES AND CLIPPINGS

THE DIVINING-ROD. — Professor Ray Lankester, having recently expressed some doubts of the alleged powers of a boy "water-finder." Dr. McClure, who is chairman of the company by whom the boy is employed, has denied emphatically that the boy, whose name is Rodwell, is an impostor. He says that the lad, when tested, never failed to find either water or mineral veins, the lodes having always been found exactly at the places indicated. The divining-rod which he holds only moves in obedience to the muscular contraction of his hands, and a rod of any kind of wood, or even of any material substance whatever, can be used, provided it be a conductor of electricity. Dr. McClure's statements have excited considerable comment in England. The phenomena of tests by the divining-rod are not by any means new. They have never been described from a scientific point-of-view, nor has any philosophical explanation of them ever been advanced, but there is no question whatever of their existence, and of their being now regarded by the most advanced scientists as beyond the region of chicanery and imposture. Mr. W. J. Jenks, in a recent lecture on "The Protection of Electric Light Stations from Lightning," treats the subject very exhaustively, and shows that where the ability to locate electrical or magnetic attraction is vested in an individual the results are absolutely reliable. He instances the case of two gentlemen of Merrimac, Massachusetts, named Prescott, who for several years have given displays of this rare faculty. As an illustration of the certainty with which the Prescott brothers could indicate the location of electrical attraction, Mr. Jenks gives a well-authenticated incident which took place at Amesbury not long ago. Several old citizens were sceptical as to the accuracy of the conclusions supposed to have been reached, and determined on a severe test. Taking twenty or more citizens as witnesses, they requested the Prescott brothers to accompany them, and indicating a stretch of highway before them, some forty or fifty rods in length, stated that some years previous lightning had struck on that road, and wished to be informed as to the exact spot. Proceeding several rods, two cross currents were marked out; both extending for some distance in the travelled pathway and crossed by another at right angles. Testing carefully the roads in both directions, this electrical centre was pointed out as the greatest danger in the vicinity. The party was then invited to examine an ancient volume of official records, where it was chronicled that on the 7th of October, 1802, a man who was driving two yoke of cattle was struck by lightning in that exact spot and, with all his animals, was instantly killed. The occurrence had been deemed at the time so remarkable that the circumstance, with a minute description of the locality, had been recorded, though long forgotten by all but perhaps a few of the oldest citizens.

THE DANGERS OF ELECTRICITY. — The rapid spread of electric lighting in America has not been accomplished without very considerable loss of life. From a list compiled by Mr. Harold P. Brown, of New York, we learn that eighty-seven persons have been killed up to the commencement of this year. This is a very serious total, and if there were any likelihood of the rate being maintained, it would supply ample reason for very stringent legislative control being exercised over all electric installations. Happily many of the accidents may be attributed to the want of knowledge which always characterizes a new manufacture, while numbers of them are also due to the hasty and careless methods of erection adopted in America. Both these causes may be expected to decrease rapidly in the future, particularly if the municipalities insist on the mains being placed underground, instead of being strung on poles in the streets. Mr. Brown is well-known from his persistent opposition to the alternate current system; he never misses an opportunity of insisting upon its dangers, and of comparing it, to its detriment, with the direct-current system. Now as the alternate system is rapidly spreading all over London and also in many parts of the kingdom, this is a question which interests us directly. Are we running special risks by permitting its establishment? As far as lighting currents of fifty or one hundred volts are concerned, it certainly matters little or nothing whether they are direct or alternate, for neither will produce any serious injury on the human frame. When it comes to currents of distribution of two thousand volts, then it is quite conceivable that death is more certain by the alternate current, but unfortunately it is also fairly certain with the direct current, so that there is very little to choose between them. A house in which the fittings were charged to such a potential would be as dangerous as a battlefield. What is wanted is sufficiently good workmanship to prevent contact ever being made between the distributing mains and the

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service wires, and this there should be no difficulty in obtaining, Even if a leak should occur the device of putting the service main to earth at one point will prevent it doing any harm. Mr. Brown refers to two cases in which men were killed by contact with a perfectly insulated wire, their death being caused by the static charge. We feel considerable doubt as to the possibility of any one being killed by a static charge under these circumstances; we prefer to believe that the insulator was bad, probably a mere taping of non-waterproof material. Just as the death-rate on a railway varies inversely as the perfection of the signalling appliances, so the fatalities in America from electricity will decrease as better materials are adopted, and more care is expended in erection. — *Engineering.*

The Monolithic Church of St. Emilion. — About twenty miles to the north-east of Bordeaux is Libourne, one of the principal towns founded by Edward I. This flourishing commercial town was the ruin of its neighbor, St. Emilion, which affords a fine field for the antiquary, nearly the whole town consisting of buildings of the Middle Ages. A considerable part of the town wall of the twelfth century remains, with the ditch, now turned into vineyards, and at one corner is a fine house of the same period, which is called the Palace of the Cardinal de la Mothe, who may perhaps have resided in it; but it is at least a century older than his time, and can hardly be later than 1200, as will at once be seen by the details. The French antiquaries say that it was built by the Cardinal in 1302, and speak of it as a remarkable synchronism in art; but the fact appears to me simply incredible. The most remarkable feature of St. Emilion is the monolithic church, which is probably one of the most curious of its class. It is cut entirely out of the solid rock, and is of early Romanesque character. The precise date is uncertain, but it appears most probable that the work was commenced in the eleventh century, and carried on through the whole of the twelfth. St. Emilion is said to have lived in the eighth century. A fragment of an inscription remains, the characters of which agree with the eleventh century; but some of the French antiquaries attribute it to the ninth. Others consider it as merely the crypt of the church above on the top of the rock; but that church is of much later character, and it is much more probable that the subterranean church was first made, and the other built long afterwards, when the country was in a more settled state. This church is 115 feet long by 80 wide. It consists of three parallel aisles, or rather a nave and two aisles, with plain barrel-shaped vaults, if they can be so called, with transverse vaults or openings, and round arches on massive square piers; the imposts are of the plain early Norman character, merely a square projection chamfered off on the under side, but one of them is enriched with the billet ornament. There are recesses for tombs down the sides, and a fourth aisle or passage has been cut out on the south side, apparently for tombs only, as it has recesses on both sides to receive the stone coffins. Still farther to the south, but connected by a passage, is a circular chamber in an unfinished state, with a domical vault, and an opening in the centre to a shaft which is carried up to the surface. Whether this was intended for a chapter-house, or for a sepulchral chapel in imitation of the Holy Sepulcre, is an undecided point. I incline to the latter opinion. This subterranean church or crypt is necessarily lighted from one end only, where it is flush with the face of the rock; and these openings are filled with Flamboyant windows, which are very evident insertions. On the surface of the hill over this church, but with a large space of solid rock intervening, is the tower and spire belonging to it. The tower is of late Norman and Transitional character surmounted by a Flamboyant crocketed spire. There is a kind of well or flue cut through the rock under the tower into the church below, apparently for the bell-ropes. In the church are remains of early painting, and some shallow sculpture, the character of which appears to be of the twelfth century. Adjoining to the church, on the south side, is a detached chapel of transition Norman work, with an apse vaulted with good ribs and vaulting shafts. A considerable part of the old painting is preserved; some of the ribs are painted with zigzags. Under this chapel is a crypt or cave cut out of the rock called the Grotto of St. Emilion, with a spring of water in it. The work is of the same early character as the other vaults. — *J. H. Parker.*

Another Tall Chimney. — A factory chimney, said to be the highest in the world, is now being erected at the Royal Smelting-Works, near Freiberg, in Saxony. The horizontal flue from the works to the chimney is 1,093 yards long; it crosses the river Mulde, and then takes an upward course of 197 feet to the top of the hill upon which the chimney is being built. The base of the structure is thirty-nine feet square by thirty feet in height, on which is placed a short octagonal transition, from which the round shaft starts. This is 420 feet high, or altogether, with the base 460 feet high, with an inside diameter of twenty-three feet at the bottom, and sixteen feet and six inches at the top. It will take 1,500,000 bricks, and the cost is £6,000. — *Exchange.*

Site of a Locrian Town. — The site of an ancient city of the Locri in modern Calabria, Italy, is in progress of excavation, under the direction of Dr. Orsi. The modern name of the spot is Gerace. A temple of six columns has been unearthed, and among the prizes is a Greek group in Parian marble, showing a divinity with a fishtail, a horse and a nude youth. The group is supposed to have been placed in the pediment of the west gable. Other finds are awaited. — *New York Times.*

The Watkin Tower. — Four hundred plans have already been received by the committee who offered prizes for the best and second-best plan for the proposed Watkin tower — the English Eiffel. It has been said that it will be so high that all that need be done when fog comes on will be to enter the lift and in a few minutes be up in the clear blue. — *Boston Post.*

Persian Court Art. — M. Georges Perrot will maintain in his forthcoming volume on Persian art, being the fifth volume of "The History of Art," that the old art of Persia had nothing to do with the Persian people, being simply official or Court art. The designers and builders, sculptors and artists, were, he thinks, not Persians, but Greeks. The architect of the palaces of Darius was a Greek or a Phœnician. — *New York Times.*

TRADE SURVEYS

There are signs of a subsidence of popular hostility to railroad combinations, trusts and commercial and manufacturing organizations of various kinds intended to conserve mutual interests. If the granger spirit had its own way it would, through its control of the legislative mills, grind a good many corporations to powder, and do tenfold more damage by its destructive methods than could possibly be repaired by mistaken remedies. It is, after all, a question whether any form of combination is possible which can very long do much damage to the people at large. These gigantic commercial and railroad organizations with which we have recently become familiar are giant-like efforts of enormous interests to rise up out of old conditions. Progress and development must take place, and the efforts of trusts, associations and combinations by whatever name known are simply the preliminary movements of mighty interests to reorganize themselves upon a broader and higher platform. The people in their jealousy and anxiety to protect themselves have, in some sections of the country, run into the adoption of extreme measures. They are already preparing to retrace their steps, and for several reasons. They are discovering that they have been fighting a bugbear; also, that their legislation against the bugbear cannot legislate. Also, that money stays away from radical communities, that many possible advantages are lost; that combinations properly controlled have, within themselves, the capabilities of accomplishing much good. Despite the threatened damage of these monster combinations prices have been quietly and steadily declining in nearly every direction; railroad freights have slipped down, notch after notch. Association after association has come and gone, and the Interstate Railway Law itself is in danger of being set aside for something better. The people are learning to have less fear of these combinations, and more confidence in themselves and for the underlying laws of trade. The year ends with gratifying results to business men in every avenue of activity. The action of the Treasury Department furnishes a hint to the country that a large supply of currency may soon become a necessity. The evil that would result from an unexpected and prolonged financial stringency cannot be measured. Over five thousand new corporations, firms and business associations have started in the South last year, as against something like 3,700 for 1888. Never in our history was there such an incubation of new business ventures. A stringency in money will destroy these by the thousand. Two or three scores of railroad enterprises which have reached the stage of bond-issuing would also be thrown aside, and thousands of enlargements of manufacturing and mining properties would be postponed; but it is useless to borrow trouble, or to paint dismal possibilities, as it is to be presumed that the people and their spokesmen fully understand the question. There is not a single branch of business in which reasonable fault can be found with results, excepting the one general result of very narrow margins. Consuming-capacity, on the whole, has increased. The wage-earners are earning as much as for years past, and are receiving more for their expenditures; that is to say, less of the product of labor in the aggregate is being absorbed by middlemen, or what might be termed non-productive agencies. The production of labor is being more evenly and equitably distributed than ever before. The ideal justice dreamed of by the philosophic socialists is within reach. In short, the wage-worker is better off, has more advantages, greater opportunities, and is yearly becoming a more important factor in the Government.

As long as railway gross and net earnings continue to improve no reaction is to be feared, according to the dictum of Wall Street. There are strong probabilities that the favorable showing will continue. The anthracite coal production for 1889 foots up 35,200,000 tons, as against 38,145,718 tons for 1888. The distribution of soft coal throughout the New England and Middle States for steam-raising and general manufacturing purposes is gradually increasing. Last week's distribution of Connellsville coke reached the unprecedented figures of 125,000 tons. The production for the year foots up over 4,500,000 tons. The expansion and development of industries throughout the Middle and Southern States continues, and hundreds of new enterprises will take shape early in the spring. Iron and steel makers are projecting new furnaces and mills in Pennsylvania, Ohio, Kentucky, Tennessee and Alabama. Some forty or fifty cotton mills are projected between Georgia and Texas. Mining companies representing fully forty million dollars of capital — that is, actual working capital — will begin operations this winter along the eastern slope of the Rocky Mountains. Industrial and building activity will take a fresh start upon the Pacific coast. Among the branches which will be developed will be saw-mill and foundry building. Machinery, engines, castings of all kinds, stoves and small iron and wood work are in great demand all along the coast from the Columbia River to Los Angeles. A great deal of capital and enterprise has been encouraged thither during 1889, and, as a result, manufacturing is greatly stimulated. The Dominion Government is also alive to the importance of developing relations with Asiatic and other foreign countries, and ship-lines are projected from its western seaports to foreign countries. Railroad-building is also being greatly stimulated by private enterprise. A vast amount of capital is drifting into the Rocky Mountain and Pacific coast regions from Eastern cities, and a great empire is being built up there which will be a source of wealth to those who obtain possession of land, timber, minerals and manufacturing facilities before the general enhancement of values takes place. The benefits originally contemplated by the construction of the trans-continental roads are now only being felt in their intensity. Irrigation companies, heavily capitalized, are doing excellent work in reclaiming vast tracts which geographers declared lost to all future utility. Mining engineers who have made a very careful examination and survey of much Western territory in the interest of Boston and New York moneyed men furnish evidences of wealth in those sections, which cannot but bring to them the money and enterprise necessary to their full development. The smaller industries throughout the States east of the Mississippi River are all doing well. Manufacturers are making money, but not as rapidly as they would like. Competition is exercising a healthy restraining influence. Like interests are being drawn together through the spirit of organization. Manufacture and agriculture are evenly balancing themselves. Commercial failures for 1889 show a moderate increase, but, considering the rashness with which ill-equipped persons enter into business and manufacturing, it is surprising that the failures are so few.

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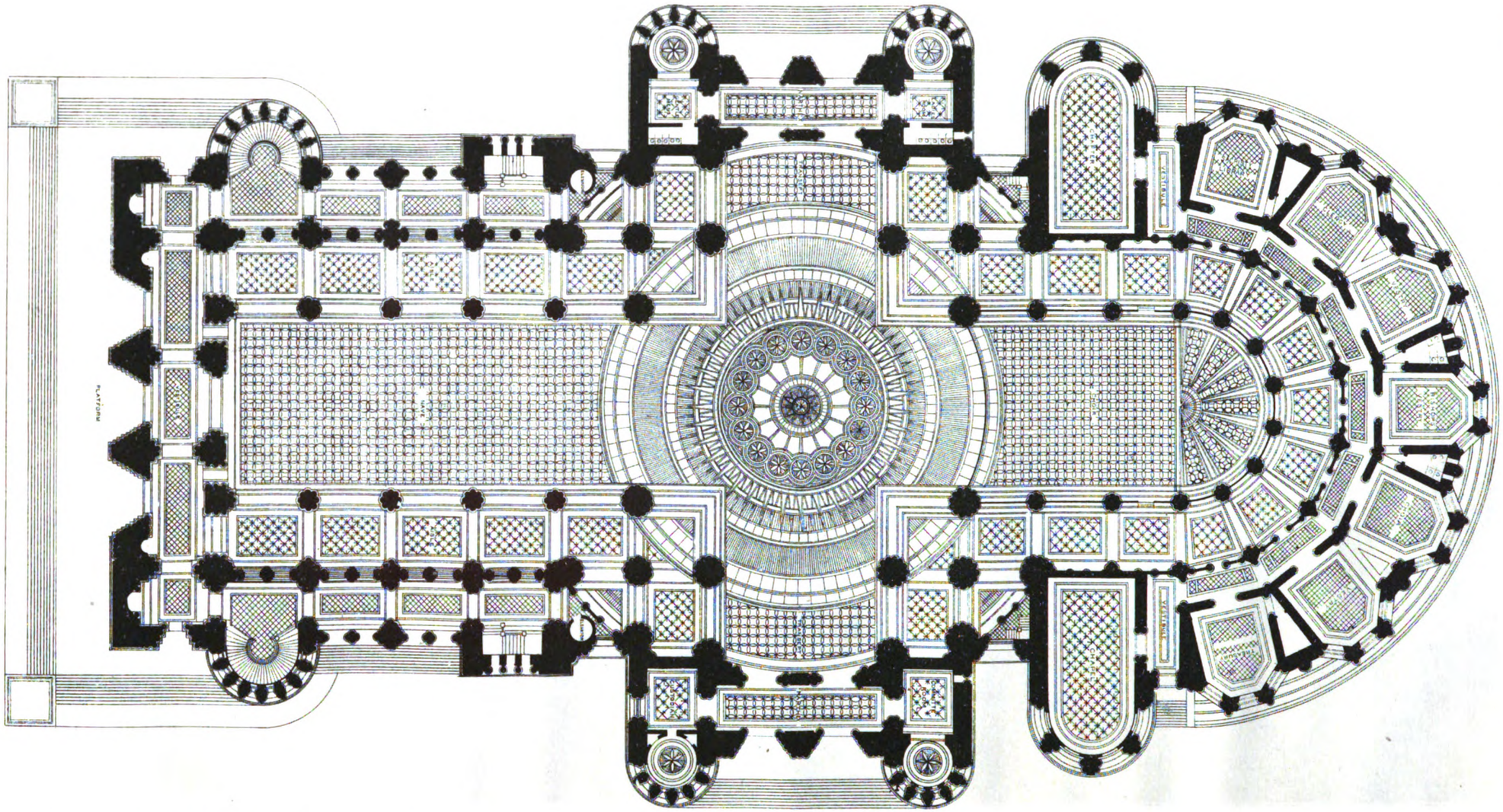

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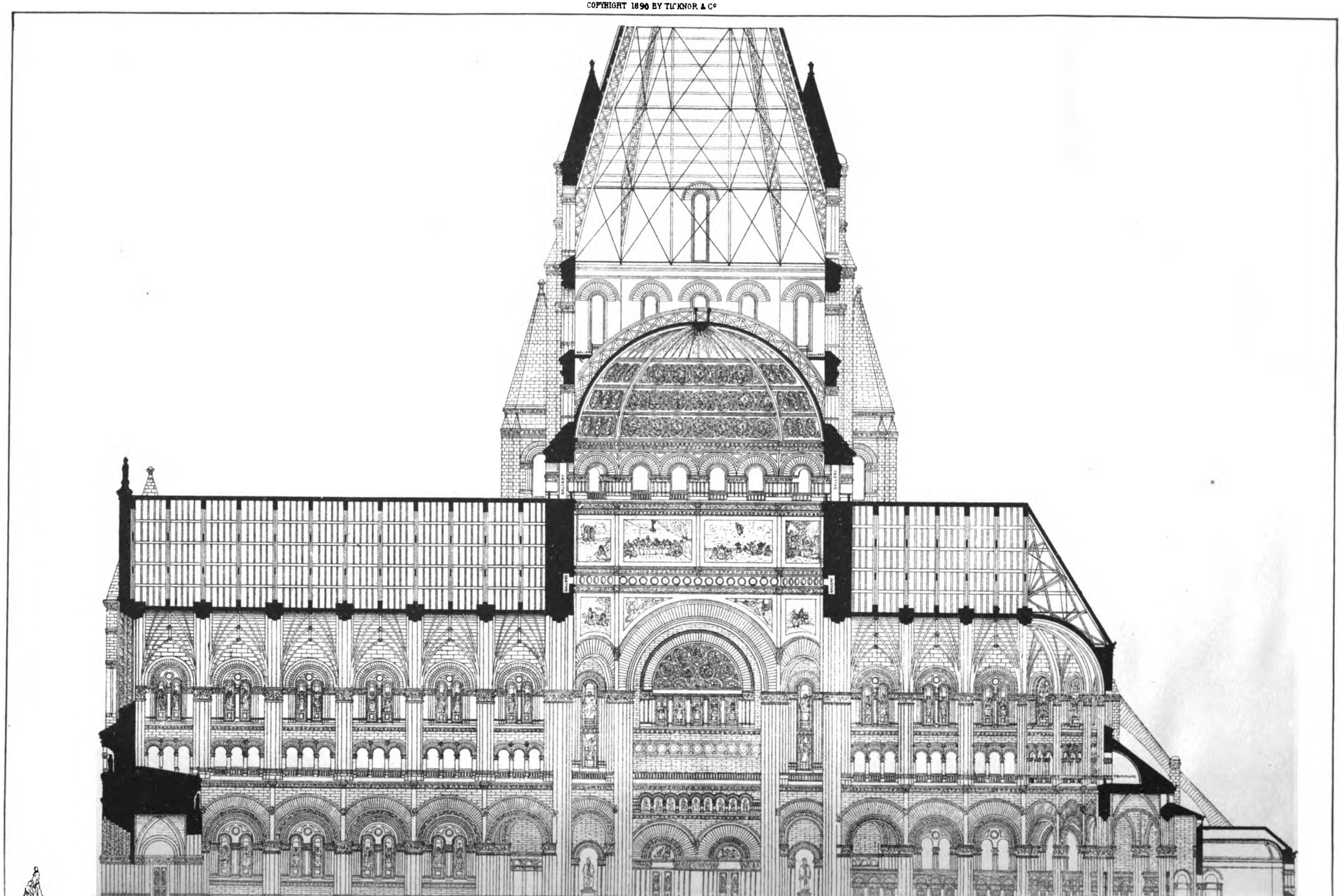

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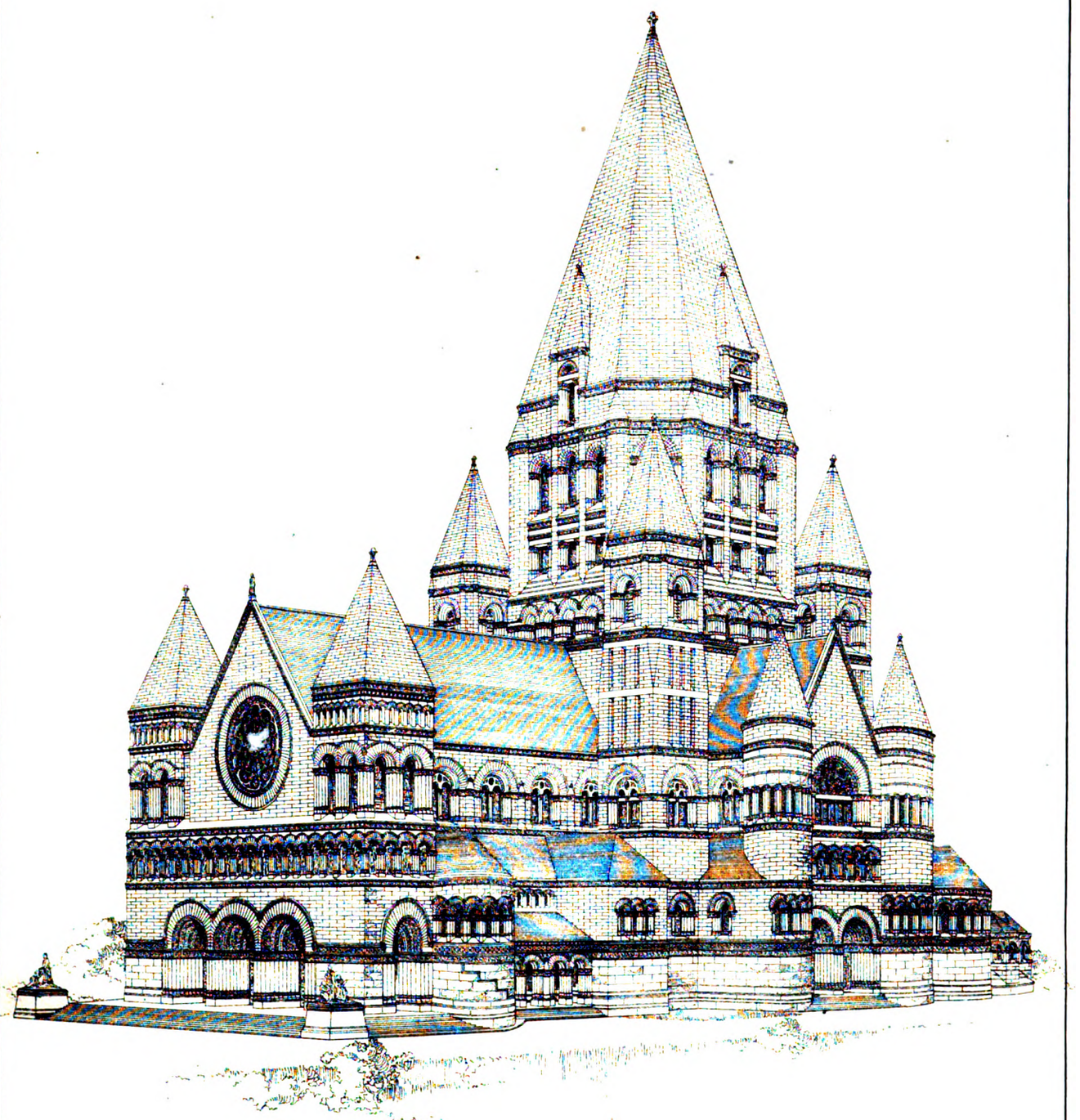

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ABERBROTHWICK ABBEY

GALLERY OVER THE WESTERN ENTRANCE.

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WESTERN DOORWAY ABERBROTHWICK

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SKETCH OF STORE
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WE wonder whether every one who receives these first issues of the International Edition of the *American Architect* comprehends the significance of the step which we, with the kind support and appreciation of our subscribers, have ventured to take. How many of those who turn over our pages realize that this is by far the most ambitious and costly architectural periodical in the world, and that it has been reserved for America to try to present every week, with a due proportion of the more valuable models from the past, an adequate view of all the best architecture which modern civilization can show? Strangely enough, in carrying out our plan of representing contemporary architecture as it should be represented, it is to Americans that we must most earnestly and urgently appeal for coöperation. We know where we can get drawings, plans, photographs, descriptions and details of all the best current work in North and South Germany, Italy, France and England, and even in Russia, but to secure anything like a decent representation of modern American architecture has hitherto been, according to our experience, absolutely impossible. Not long ago a discussion took place in England about architectural periodicals, and one or two of the American journals were mentioned with commendation, on account of the beautiful drawing and process-work in their illustrations, as well as the value of their text. Not long afterwards, a disparaging commentary on this discussion was made in one of the English professional papers, to the effect that it was a great mistake to value so highly the illustrations in the American journals, for the reason that, although charmingly executed and fascinating, they rarely represented architectural work of any importance. Our readers, especially those faithful friends who have stood by us for years, will understand that this was a sharp thrust, but it is, and not through our fault, altogether too well deserved. While in all other countries where architecture is practised, every important competition is regularly illustrated from the competitive drawings themselves, which are, as a matter of course, placed at the disposal of the professional journals; and plans, elevations, sections and perspectives of all new buildings of interest, and often photographs from the models for the sculptured detail, and illustrations of the schemes for heating and ventilation are gladly furnished by the architects, who understand perfectly that their professional reputation depends in great part on the publicity which is given to their work through the medium of the technical press: in this country, on the contrary, the attitude toward technical journals of a great many architects, and among them some who are constantly engaged upon very important work, is one, apparently, of grave suspicion. The most earnest appeals by letter on the part of the editors for permission to publish plans or elevations of a successful building by one of them meet with no response. Then the editor takes two or three days from his abundant leisure, and calls personally upon the professional magnate. The latter seems pleased to see him, shows him the drawings of the building in question, appears to be gratified at his praises, and readily agrees to allow the publication of the plan and perspective. The editor lays these drawings aside, and proposes to take them with him, but the architect politely insists that he cannot allow him to burden himself, and promises that he will send them immediately by express. The editor returns to his desk, and arranges space for the expected drawings in the next issue, but they do not arrive. Two or three weeks go by, and he then writes to the distinguished architect, to remind him of his promise. The letter brings neither the drawings nor any other response, and, after a final entreaty, as unsuccessful as the rest, he abandons his efforts, to begin them again with a fresh subject, who proves as slippery as the other.

AFTER a good many years of such struggles, we should be inclined to say that we would trouble ourselves no further, and that American architects who are capable of carrying out important work successfully, and do not want other people to know it, may please themselves in the matter, were it not that, in a journal which now intends to show what is done all over the world, we most earnestly wish to have American architecture properly represented. We are sure that the best of it is equal to the best anywhere, and we want to be able to prove it. The treatment of our modern mercantile and business structures, particularly those ten or twelve stories in height, is more successful than any other work of the kind in the world; the planning of our office-buildings is unrivalled anywhere, and some of our apartment-houses will bear comparison with the best in Paris — which are the best anywhere — and are more interesting, on account of the more complex character of the services which we must provide for. Besides this, many details of American construction, such as the encased iron framing and isolated pier foundations of the Chicago architects, and the heating and ventilating systems in use everywhere here, are far in advance of foreign practice, and we want our foreign readers to see this with their own eyes, and to give their American brethren their proper rank in the profession. To do this we must have the material, and we appeal once more to American architects who have it to furnish it, and to those who do not have it themselves, but who know where it is to be found, to get it for us, or to put us in the way of getting it. Plans, elevations, perspectives, sketches, photographs, negatives, descriptions, whatever is good, we want to show, for the benefit and reputation of the profession in America far more than for our own, for we know better than the profession how very valuable publicity of the kind is to architects. The late Mr. Richardson, even to a comparatively late period in his professional career, was afflicted with the usual bashfulness about having his work published. We well remember the solicitations, the refusals, the renewed appeals, and, finally, the reluctant and conditional assent to have a single gelatine print from one of his perspectives published. This was the drawing, we think, of the Woburn Library, and was accompanied by a plan. Finding that he had suffered no severe injury from this exposure of his design to the gaze of the cold world, Mr. Richardson soon became one of our kindest friends, and if reputation and employment are things to be desired by an architect, we may say with all due modesty that what he did for us was repaid to him a hundred-fold, for, great as was his talent, it must, without the publicity given to his work through means like ours, have had for years only a local

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influence. As it was, however, every issue of ours with one of his designs was studied in a thousand offices and imitated in hundreds; his name was in the mouths of all architects throughout the Union; our plates were reproduced abroad; the illustrated magazines, finding his reputation already made in the profession, hastened to spread it among the public; and at his lamented death, a few years later, he was the central figure of American architecture. Now, although we do not say that all the architects who send us their drawings will attain the fame of a Richardson, we do say that Richardson would never have attained a fraction of his reputation if he had not allowed his designs to be published, and we need hardly say further that if any architect has done a good piece of work, and has it published, more people will know about it than if he kept it to himself; and the more people know about his good work, the more will come to him to get some like it, the better will be his standing in the profession here, and the more credit he will do his country abroad.

IT may be as well to disarm criticism and complaint by stating that there will be throughout the year more or less of irregularity in the appearance of the additional illustrations in the International Edition, owing partly to steamer delays, and partly, perhaps, to misunderstanding of our instructions on the part of our correspondents. It will not be proper, therefore, to compare one issue with another, and assert that we are falling short of our promises. When the end of the year is reached, the subscribers to that edition will find, on review, that our promises have been fully kept, and that the edition has been what it professed to be. Naturally, defects and deficiencies will be more apparent at the outset, when the complicated details of supply have not been definitely adjusted.

THE profession in Brooklyn, N. Y., has to mourn the loss of Mr. Charles Keely, son of Mr. Peter C. Keely, the architect of so many Catholic churches all over the country, and associated with his father in business. The practice of the office is enormous, fifty churches, it is said, being sometimes in process of execution from the designs of the father and son, and of the excellent work done there, no doubt much was due to the younger man's talent. Mr. Keely was about thirty-five years of age, active and popular. He died of pneumonia in Hartford, at the house of the bishop, whom he was visiting on business.

A DEPUTATION was presented to the Ways and Means Committee of Congress the other day from the Free Art League, which urged the abolition of the present duty on foreign works of art. The deputation consisted of Mr. Carroll Beckwith and Mr. Kenyon Cox, with Mr. William A. Coffin, who, after mentioning some of the obvious reasons for abolishing the tax, stated that, in response to a circular sent out by the League, fourteen hundred and thirty-five communications were received from artists, teachers of art and others whose opinion would be of value. Of these, thirteen hundred and forty-five desired the immediate abolition of the duty, eighty-three favored a moderate duty, ten per cent being mentioned by twenty-eight out of the number and seven wished the present impost retained. The Ways and Means Committee, according to the newspapers, listened politely to the artists for a time, and then turned their attention to the duty on carbonate of soda. Whether, in the presence of practical matters like carbonate of soda, they will ever think again of the tax on mere works of art, remains to be seen.

FIRE AND WATER says, referring to some remarks of ours about the policy of transferring the fire-extinguishing apparatus of small towns to any neighboring large one in which a serious conflagration happens to break out, that we were mistaken in "supposing" that the insurance companies might refuse to pay losses in suburban towns occurring during the temporary absence of the regular protective apparatus, and that as the contract of insurance does not mention anything of the kind, the companies would be compelled to pay losses, whatever happened to the engines, so long as their policies remained uncancelled. Now, in the first place, we did not "suppose" or "assert," as another paper says we did, anything about the matter. We simply said we had been told that the companies would not pay in such cases, which was true. We were told that, and by an insurance agent, who ought to know something about it. Moreover, this was not the first time we have heard the same thing. Not long ago, in a discussion in the city government of a town near Boston, one of the members protested against allowing the town engines to leave the limits of the municipality, for the same reason, that the insurance companies would not pay losses occurring while the engines were absent. As to the contract in the policy, we have often seen clauses requiring the insured to notify the company of any circumstances affecting the risk, of which the absence of the town engines might be considered one. so, in our ignorance, we, and, we imagine, a good many others, would be glad to have an authoritative statement from the companies themselves on the subject.

ACCORDING to the *Wiener Bauindustrie Zeitung*, the splendid Brunswick monument at Geneva is on the point of falling down. Every one remembers the history of this structure, which was erected in 1879, at a cost of six hundred thousand dollars, to the memory of Charles the Second of Brunswick, the "Diamond Duke," as he was called by the Germans, who, after his expulsion from his principality by his subjects, on account of his extravagance and general worthlessness, took up his residence in Geneva, and, on his death, in 1873, bequeathed all his property, about four million dollars, to the city. The municipality was grateful enough to carry out in a very sumptuous manner the last wishes of its benefactor, who desired to be commemorated by a monument in the style of the later Scaliger tomb at Verona, and from the designs of Franel was erected the hexagonal Gothic pavilion, surmounted by an equestrian statue of the Duke, which is so well known to architects. The Veronese prototype of the monument is a tolerably insecure affair, but the modern imitation is still larger and heavier, and two years after its completion the substructure began to come to pieces. It was then clamped with metal, but water got into the joints, and further repairs were soon necessary. In 1883, the Carrara marble of which it was built had so far decayed that the rebuilding of the whole with more durable stone was seriously proposed; and now, examination having shown that the whole affair is likely to collapse at any moment, the city authorities have asked for authority to raise eight thousand dollars, by loan, to put it in secure condition. To tell the truth, it would not be an irreparable loss to the world to have the structure go to ruin. An imitation of an existing monument is not likely to be a very inspiring work of art, and this was not extremely successful, even as an imitation; while the historical fact which it immortalized, that the last representative of one of the six great German princely families, whose ancestors had been reigning sovereigns for a thousand years, had been obliged to set up the images of his haughty forefathers in a community of Republicans, because his own people despised and hated him so much that they could endure him no longer, was not of a character to arouse noble thoughts in the mind of the beholder.

WE have before called attention to the great and rapidly increasing importance of the South American Republics, and, while there seems to be no prospect that our proximity to them will be of any commercial advantage to us, some of our young architects and skilled mechanics, who speak Spanish, might perhaps find profitable employment there. At present, the most prosperous city is Buenos Ayres, which, from one hundred and sixty thousand inhabitants in 1870, increased to four hundred and sixty thousand in 1888, and has gained very rapidly within the last year. We must confess that our own ideas of Buenos Ayres still retain a reminiscence of gauchos and lassoes and buffalo, but this grows fainter as we find illustrations in the foreign papers of the newer buildings going up in the city. The last we have seen is of an enormous dry-goods store, after the model of the "Bon Marché" or the "Printemps" in Paris, which is known as the "Bon Marché Argentin," and covers at present ninety thousand square feet of land, while thirty-five thousand feet adjoining have been secured, and are to be used for the enlargement of the present building which will soon become necessary. There are said to be a good many architects already in Buenos Ayres, but first-rate mechanics are, or were not long ago, so scarce that the municipality imported plumbers under contract from London to do work on public buildings.

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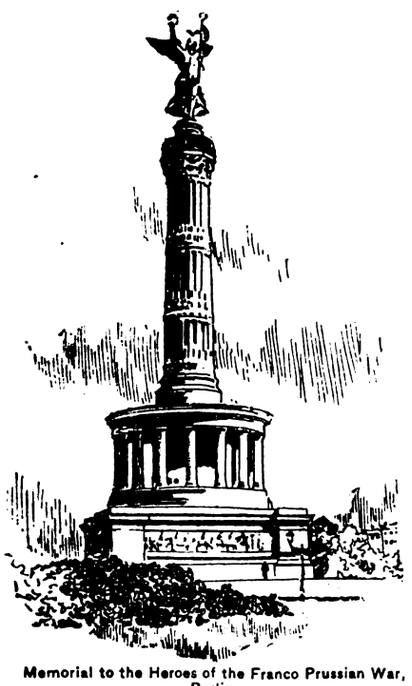
CIVIL AND DOMESTIC ARCHITECTURE.[1] — I.



Memorial to the Heroes of the Franco Prussian War, Berlin.

THE term Civil and Domestic Architecture includes all public and private edifices, that is to say: honorary monuments, such as triumphal arches and tombs; buildings for the instruction of the public, such as museums, libraries and schools; houses for public amusements, as theatres, amphitheatres and circuses; structures for public service, as city-halls, court-houses, prisons, hospitals, thermæ, markets, warehouses, slaughter-houses, railway-stations, light-houses, bridges and aqueducts; finally, private dwellings, as palaces, mansions, city and country residences, châteaux and villas.

The first care of all social organizations, at their inception, must have been to provide shelter against inclement weather. In primitive times society was composed of shepherds, or agriculturists, or hunters, and it is presumable that each of these groups adopted a shelter suited to its nomadic or sedentary tastes. For this reason to shepherds is attributed the invention of the tent, a portable habitation which they could take with them from valley to valley, wherever they led their flocks to pasture; agriculturists fixed to the soil which they tilled, dwelling in the plains and along the river banks, must have found the hut better adapted to their wants, while the hunters, stealing through the forests, ambushed in the mountains, or stationed on the seashore, naturally took safety in caves, or dug holes for themselves in the earth, or hollowed out grottos in the rocks.

An imitation of the tent is found later on in the form of the Chinese and Japanese structures; the principle of the cave appears developed in the subterranean dwellings of the people of India and Nubia; while the hut is the point of departure for all Greek and Roman architecture.

As soon as man had contrived a shelter for himself, before considering improvements that might be made in it, he turned his thoughts toward the divine being of his worship, and the first steps in art were taken in the monuments which he raised to his gods. Then, confounding kings with deities, he reared palaces like unto temples. But civil architecture, properly so called, came into existence only with an already advanced state of civilization, when cities were forming and peoples were organizing. After having satisfied the demands of the moral nature, after having erected temples to their gods and palaces to their kings, the people began to group together and surround themselves with fortifications. Next the material needs of society made themselves felt; aqueducts were constructed to suppy water; bridges established communication between the opposite banks of streams; dikes confined the rivers within certain bounds; streets were laid out along which houses were built in orderly fashion, public squares were marked off where the products of industry could be exchanged, where justice was dispensed and where the great affairs of State were treated; then came mental and physical demands, a felt need for the training of body and mind, and out of this want grew theatres, stadia, gymnasia and thermæ. In time we find the history of a single people developing; and with this development a necessity arising for lasting monuments to commemorate its various stages; public services rendered by certain illustrious men called for some enduring memorial; and relatives and friends, with whom one had lived and whom the dread enemy had snatched away could not be left without sepulture. Is there nothing after death? And so honorary monuments, triumphal columns, statues and tombs sprang into being. Again, with the growth of a people, wealth increases, and every new victory assuring an added degree of ease introduces at the same time extravagant tastes; a people after enduring suffering cries out for its portion of pleasure; it was to satisfy this demand that circuses were built, and amphitheatres where the eyes could feast on imposing spectacles; private houses became more comfortable, they were improved in arrangement, they were enlarged and embellished; at length an extraordinary display of sumptuousness began to appear in the dwellings of the great, — that luxury of decadence which marks the close of ancient civilization.

[1] From the French of G. Guioestre, in "*Encyclopédie de l'Architecture et de la Construction.*"

With the advent of Christ came new ideas which caused new departures, not only in religious and monastic architecture, but in civil architecture, as well. Christianity, in proclaiming a new virtue, love, created retreats for the unfortunate, asylums for their reception and hospitals for their care. Monkish orders, in their efforts to prevent the destruction of old manuscripts, spread knowledge around them, and following the example set by them in their monasteries, outside colleges were founded. With the dissemination of knowledge, cities roused out of their long sleep; their independent spirit began to shake off the yoke of their oppressors; they formed themselves into communes and various privileges were granted them. Under certain conditions, and in consideration of the discharge of certain obligations, the commune is seen at length assuming the administration of its own affairs. From this moment an assembling-place is needed where communal interests can be discussed and where questions can be put to vote. The town-hall, with its belfry from which could be proclaimed afar all immunities won, supplied the want. Around this centre markets sprang up, and exchanges where merchants could negotiate and transact business. Finally, the less exclusive modern spirit made itself felt, and, soaring beyond the city bounds, it projected works of a genuinely public nature, not for the benefit of this or that city, but for the entire country. Political centralization, governmental unity, later on, made it possible to run canals through different provinces, to establish barracks for troops over broad stretches of territory, to build court-houses and prisons, to reconstruct hospitals on new plans, and to open more extensive exchanges, markets, warehouses and slaughter-houses. Public instruction also had its imperious demands, and States were forced to sprinkle their lands with school-houses of every grade, from the simplest asylums and primary and secondary schools to special government institutions; libraries and museums were founded to satisfy still other claims of education. Then with the ever-increasing wants of a civilization, eager for progress, in the presence of the important discoveries of science, before the invasions of finance and the extension of governmental machinery, architectural designs are indefinitely multiplied to supply suitable departmental buildings, banking-houses, houses of commerce, quarters for public officers and public boards, railway-stations, inns, custom-houses and toll-houses; to say nothing of private residences and play-houses, bathing establishments, casinos and villas, whose designs change from time to time with the manners and customs of the period or people.

Civil architecture, in the proper sense of the term, originated with the Greeks and was extended in a surprising degree among the Romans. All the other peoples of antiquity devoted themselves to the rearing of religious and sepulchral monuments, and to the construction of palaces for their sovereigns. Their political organization did not lend itself to development in other directions. So long as a people is not considered as an individual there can be no thought of erecting for its comfort or education structures of any considerable importance; so long as it has no existence as a civil body there can be no call for the building of edifices wherein to discuss its own affairs or the affairs of State. Nevertheless, aside from temples and palaces, there are certain works of public utility which are forced upon all civilizations, and among all organized peoples a domestic architecture exists which answers to their needs and which we cannot pass over in silence.

The sacred books of the Hindoos give us the plans on which their cities were built. There were forty different kinds of cities, distinguished one from the other by their extent and form. The streets crossed at right angles. The centre of the city was reserved for sacred uses and was inhabited by the Brahmins; around them dwelt the people, and the angles were occupied by the exchanges, markets, colleges and other public structures. The city was always walled, with a gate on each of the four sides and one at each corner.

Private dwellings varied in height according to the rank of the owners. Those of the inferior classes could have only one story above the ground-floor, and in most cases they were limited to the ground-floor itself. The door was never placed in the centre of the façade. Its position, as well as its height and breadth, was fixed by rule; the same was true of the windows. The streets were supplied with running water, and adorned with avenues of trees; they were bordered by rich shops and houses set close together, with no intervening spaces. The palaces, which were composed of separate buildings, approached by porches, were usually erected around small courts, and these courts were almost always planted with trees. The roofs were flat, and the narrow, rude staircases were made in the thickness of the walls. The Hindoos also constructed huge reservoirs, and reared columns and square triumphal arches in honor of their heroic victors; they are also known to have built bridges, the piles of which, formed of enormous blocks, were connected by stones of a single piece.

Passing into China we encounter a civilization whose antiquity rivals that of India. However, there are no very ancient remains there. But there is documentary evidence that the Chinese, several centuries before the Christian era, built from the same designs that they use to-day. Architecture being the expression of the needs, instincts, character and traditions of a people, and the Chinese having in no way modified their manner of living or their traditions, we can easily understand why their architecture has undergone no modifications.

The Great Wall, running along the north of China proper, with a length of fifteen hundred to eighteen hundred miles, is the only

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Chinese work that can boast of its antiquity. It is attributed to the emperor Tsin Hoang Ti [Che Hoang-te], who reigned in the third century before our era, and who is said to have employed in its construction five or six million men. The foundations are of hewn stone, the rest is of brick faced with smoothly-joined stones. The wall is battlemented, flanked with towers, and is provided at certain intervals with fortified gates. It is broad enough for six horsemen to ride abreast on it.

Among the great works of the Chinese, mention is also made of the bridge of Loyau at Sueno chou Fou; it is built over the point of an arm of the sea and comprises two hundred and fifty piles made of material of enormous bulk. The roadway is formed with single blocks of granite, and is guarded on each side by a balustrade.

There are other bridges raised on vaulted arches. Others, still, are decorated with triumphal arches, such as that of the Province of Kiang-Nan; and again there are others built of wood, like the bridge of King-Chou-Fou, with the flooring supported by iron chains fastened to rocks.

The cities are generally laid out on a square plan with the angles directed as far as possible toward the four cardinal points, and the predominance of a single architectural type imparts a certain monotony to the streets. The enclosing walls are flanked with towers and their gates are surmounted by lofty structures which include an arsenal and a guard-room. Besides the temples and commemorative monuments erected on the same plan as the temples, at the entrance to certain streets and before certain edifices monuments in the form of gates are to be seen. These structures, called *pai léou*, are nothing else than triumphal arches raised to the memory of emperors, generals, mandarins and all those who have rendered important services to the country. The bases of these arches are of stone, the rest is made of wood; they have a single bay, or one principal bay with two smaller ones, and the top is in the form of a Chinese roof.

The palaces present a succession of spacious courts surrounded by buildings and are entered through gates in the form of triumphal arches. Each separate portion of the structure is destined to a special use. The women and children are usually relegated to the rear court.

The houses have one or two stories; their dimensions are regulated by law, according to the rank and condition of the owner, and, as in all Oriental dwellings, there are but few openings on the street.

While the Hindoos built with enduring materials, the Chinese generally used brick and wood. The explanation of this fact is to be sought not so much in their fear of the earthquakes with which they are constantly threatened as in their narrow-mindedness and lack of ambition; they saw no reason why an edifice should outlast the generation for which it was constructed.

Judging from the ruins of Persepolis, the Medes and Persians must have attained to a high degree of civilization in the time of Cyrus, but we have no authentic records concerning their civil architecture. Their art is derived from the Babylonians and Assyrians, from whom they must have largely borrowed their customs.

The Assyrian palaces consisted of three wholly distinct groups of buildings, three divisions which we find exactly reproduced to-day in the seigneurial and princely dwellings of Persia, India and Turkey. First, there was the seraglio, or the palace properly so-called, which comprised the reception-halls and the men's apartments, and which is known now throughout the East under the name of *selamlik;* then came the harem containing the private rooms where the master saw his wives and children with their guards of eunuchs and their throngs of attendants; and lastly, there was the *khan*, a cluster of dependent structures including servants' quarters and out-buildings. In princely palaces each of these divisions included several courts, and the whole was disposed around a principal court, the court of honor. The entire assemblage of edifices was nothing more than one vast ground-floor. "The design followed in the arrangement of these composite dwellings," it has been said, is almost naïve in its simplicity: the plan is merely divided into as many right parallelograms as there are services to be provided for, and these rectangles are so disposed as to touch along one side or at one of the angles, but they never interfere with or command one another; they are contiguous or adjacent but always independent. Thus each of the three divisions (seraglio, harem and khan) presents a rectangular figure, and each borders one side of the principal court, which is neutral ground,—the common centre around which all are grouped. The same principle of arrangement is applied to the subdivisions of the great quarters; the latter are composed of smaller rectangles distributed about an uncovered space, on which each apartment opens, with no direct communication between adjoining rooms through partition-walls. In this way all the sections of an edifice were clustered together and at the same time isolated; and each of these sections had its special use and its pre-assigned occupants.[1]

Drains were contrived under the palaces, and certain square rooms were covered with dome-shaped vaults.

The houses, built of brick, were of two different types; some were covered with hemispherical or parabolical calottes, others had flat roofs with a tower in the fashion of a belvedere. They were generally quite low, except in large cities like Babylon, where they were sometimes three or four stories high.

[1] Perrot and Chipiez. "*Histoire de l'art dans l'antiquité.*"

The towns were regularly laid out; the streets ran at right-angles to each other; quays were built along the streams, and bridges established communication between their banks. The large cities were protected by a fortified wall. The gates were arched and flanked each by two towers which were separated by only the width of the entrance. Some of the gates were ornamented, others were plain, but each one was in itself an edifice of quite complicated structure.

The city gate played then, as it still does all through the East, an important rôle in the life of the urban populations. It was an agora for the Greeks, a forum for the Romans. The people gathered there to chat, and learn the news, and there the old men acted as arbitrators in case of quarrels. In the same way it was at the palace-gates, which were always constructed on the model of the city-gates, that the court attendants assembled, and that petitioners stood in waiting.

The Phœnician cities also were surrounded by fortified walls, and dwellings were burrowed into the very body of the ramparts. In order not to extend the limits of the city too much, the houses in the central portions were built very high. In the chief quarters of Carthage some of them had as many as six stories; they were covered with flat roofs, and, as is the case of all warm countries, the streets were narrow. The residences of the rich merchants were of a marked character and were easily distinguished; they were all provided with cisterns; they had inner courts adorned with porches, and with open galleries along the upper stories. The streets, squares and courts were paved with broad flags, probably for the purpose of saving every drop of water that fell. There were also public cisterns, and ports for shipping. As their country abounded in stone that could be easily cut, the Phœnicians used no artificial building material: they are not known to have built of brick before the Roman period.

In Judea, while enormous, rough blocks were used in huge structures, the houses were made of unburned brick, with ceilings of palm or sycamore beams covered with a layer of hard earth. In order that the variations in temperature should not be felt in the interior, the outer walls and the roof had to be quite thick. All the dwellings were covered with flat roofs surrounded by a parapet, and here people passed the night in certain seasons. Most houses had only a ground-floor; but the residences of the wealthy sometimes boasted of an upper story, and certain windows, doubtless those lighting the women's apartments, were provided with lattices similar to the *moucharabieks* of the Arab houses of the present day.

The villages were generally built on the hill-tops, and the more important of them were surrounded with fortifications. Jerusalem was the seat of royalty. It was there that David reared his palace, to which Solomon added numerous edifices that occupied thirteen years in construction. Other great works were undertaken by the Hebrews, with the view of carrying to a distance the precious water of the springs; and they were compelled to supplement their scant supply of water by digging wells and making cisterns.

In Egypt, the attention of archæologists was so long riveted on the temples and tombs that it is only recently that a study has been made of private dwellings. To-day, however, something is known of these.

The streets of Egyptian cities were usually laid out regularly, but they were so narrow that, except in the principal ones, two chariots could scarcely pass. This narrowness of the streets, which is frequently observed in the ancient Arab cities, and which has been so long maintained in all hot countries, had the advantage of securing shade at all times on one side of the street. The buildings along the street were ordinarily separated from each other by alleys; they were rarely more than two stories high, except in such large cities as Thebes, where they sometimes reached four and even five stories. The houses were so arranged as to meet the demands of the climate. A court often preceded the apartments which were disposed along both sides of a long corridor. In other cases the rooms occupied three sides of the court; or oftener still the court was surrounded on all sides by the different structures. The ground-floor was reserved for the stables; it was used also for storing the corn, and it contained the kitchen and the cellar. The family occupied the upper stories. Above the whole was a terrace where they could enjoy the cool air and even pass the night, when the heat was excessive. Sometimes the terrace was protected by a light roof supported by slender wooden columns. There were but few windows, so as to keep the sun out as far as possible, and such as there were were placed nearly at the top of the rooms.

The houses were built of unburned brick, made from a heavy clay, mixed with a little sand and chopped straw; this was shaped into oblong slabs which were dried in the sun. Bricks of ordinary size measured 8¾ in. x 4¼ in. x 5¼ in., the large ones were 15 in. x 7 in. x 5¼ in. There were special marks to indicate where they were manufactured; some came from the royal works, some from private shops. The foundations of the buildings were not deep; the walls were whitewashed, or painted in bright colors; the floors were of brick or flagging, or simply of hardened earth; the roof was flat, with a framework of palm branches covered with a coating of earth sufficiently thick to prevent the infiltration of the rain. The dwellings of the wealthy lords were usually erected in the centre of a garden, or of a cultivated court, and occupied a considerable space. The entrance was announced by a colonaded porch or a pylon, and the interior was like a small city,—the dwelling in the background, with the granaries, stables, servants' quarters and out-buildings disposed here and there about the enclosure.

In the more important palaces, the dwelling of the master stood in

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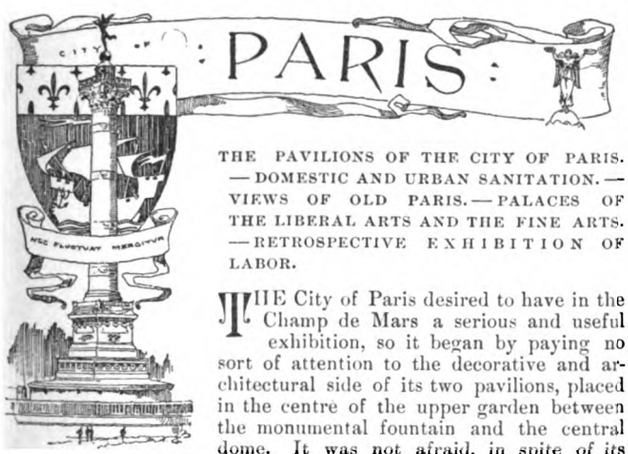
the centre of a rectangular court, the sides of which, on the right and left, were occupied by the storehouses.

Like all other peoples of antiquity, the Egyptians were obliged to protect their towns from the incursions of enemies. The greater part of their cities, and even the principal villages, were therefore walled. Man will never cease to fortify his cities until these fortifications have been proved unavailing before the power of new engines of destruction.

In this rapid review of the civil architecture of the ancient peoples of Asia and Egypt, we have discovered no traces of structures whose destination indicated any care for the development of the lower classes of society, no remains which implied their participation in any municipal life whatever, no edifice erected for the purpose of national education. Such institutions had no place under a theocractic government which absorbed into itself the entire nation. When it had made provision for the defence of its cities, erected temples to its gods, reared palaces for the earthly abode of its monarchs and tombs for their future life, when it had satisfied the simple material needs of the people, what more could be asked?

[To be continued.]



THE PAVILIONS OF THE CITY OF PARIS. — DOMESTIC AND URBAN SANITATION. — VIEWS OF OLD PARIS. — PALACES OF THE LIBERAL ARTS AND THE FINE ARTS. — RETROSPECTIVE EXHIBITION OF LABOR.

THE City of Paris desired to have in the Champ de Mars a serious and useful exhibition, so it began by paying no sort of attention to the decorative and architectural side of its two pavilions, placed in the centre of the upper garden between the monumental fountain and the central dome. It was not afraid, in spite of its surroundings, to shelter itself within the simplest of buildings in plaster, with a decoration meagre and accentuated by the needs of construction. In fact, the large entrance doors, all of wood, were made afterwards and applied to the plaster, and the same may be said of all the visible woodwork; but this lack of ingenuousness in the construction is not to be too severely blamed, since it is a question of pavilions which are to disappear after an existence of six months. Economical reasons are always worthy of respect, and the modesty of the Municipal Council on this occasion ought to be praised. But what one has a right to criticise is the unhappy idea which placed these pavilions in such a manner as to completely obstruct the view of the exterior porticos of the palaces and industrial sections when one stands before the central dome in the centre of the garden. This criticism once made, there only remains to give expression to praise of the exhibit made by the city of Paris. Very well arranged inside, very well considered, it possesses enormous interest principally from the point-of-view of hygiene and the sanitation of the city. This is a question much studied for a long time back, and is one which marches towards a solution which promises to be perfectly satisfactory in view of the progress already made. Wide streets have replaced narrow alleys, air circulates freely everywhere, trees and enormous gardens have been planted on every side, and the salubrity of the house is assured by a severe inspection, one which will become yet more severe, it is to be hoped, in the case of those owners who are inclined to despise regulations. It would be so simple in place of continuing the ancient ways, whose inconveniences are so well demonstrated in the large model of an unhealthy house exhibited in the pavilion of the city of Paris, to adopt all the new systems of sanitation which, on their part, are shown in application in the model of a sanitarily perfect house which has been placed opposite to it. To establish this comparison two very simple models of construction have been selected, proving that healthfulness is not merely an attribute of luxury, but that the most modest houses can present all possible guaranties from this point of view. The healthfulness of houses, and consequently of cities, depends amongst other multiple but relatively simple causes on two preëminent conditions, — that of the removal of excrement, and the purity of the water-supply. In a large degree the first condition is subordinated to the second. "Everything to the sewer" is recognized by the most competent hygienists as the best system, but only on the condition that water shall be abundant and that no stagnation of the material shall be allowed. These problems, which were for a long time studied by M. Durand-Claye, and to which he devoted himself until his premature death unfortunately took him from us, have received the attention of his devoted successors, who have already brought to fruition interesting solutions which prompt us to hope for a completely satisfactory system in the near future.

Three glass reservoirs, containing water from the Seine, from the Ourcq and the Vanne, allow us to perceive the difference of quality which exists between these three sources of supply, the first of which, with its yellow color, is anything but appetizing, and the second is not much less doubtful, while the third, alone, presents the limpidity and transparency which one has a right to demand in potable water. Nevertheless, one should not believe, as many persons do, that the water that we see in this reservoir, and which has been taken within the limits of Paris, is the same that is distributed from time to time through each quarter. The water there used is taken up-stream and before it has been soiled by its passage through the suburbs and city.

In the same pavilion the Administration has exhibited the plans and the comparative views of the city taken at different epochs since 1789 up to the last months of 1889. We here see the march of progress in this immense city, expanding without cessation like a drop of oil, and as it enlarges crossed by great arteries which establish across its mass conduits for aeration, and at the same time suppress the agglomerations of former days.

For artists and archæologists and lovers of old Paris, whom these new transformations displease and who regret the picturesque past, the authorities have had the forethought to paint or photograph before demolition the quarters which to-day have disappeared, or are on the point of disappearing; and as a consolation such persons have very pretty pictures by M. Pansyer, representing St. Julien le Pauvre, the Rue Galande, the Place Maubert, the ruins of the Opéra Comique, the flower-covered relics of the Cour de Comptes; and there has even been evoked for them the manor-houses of Clichy and Monceau such as they were in 1789, and also the quarter of the Bastile, which can thus be compared with their present aspect. Not far from these antiquities the City of Paris has exhibited some decorative paintings executed for its various *mairies*, the "Abreuvoir" and the "Lavoir" of M. D. A. Baudoin, and for the *Mairie* d' Arcueil-cachan "L' Automne et l'Eté," by M. A Séon; "The Marriage," by M. Glaize, and a fine painting, "The Defense of Paris in 1814," by M. Schommer. Other compositions are signed by Cormon, Gervex and Boulanger.

Finally, to make an end of the important works which she has caused to be executed, the City of Paris exhibits models, at a reduced scale, of the new Sorbonne, of the Ecole de Médicine, and of the Ecole Pratique, at present in course of construction, also plans and photographs of buildings erected during the last ten years, such as schools, *mairies*, etc. The department of sidewalks and plantations is represented by a reduced model of the Crematory at Père Lachaise, plans and views of the new cemeteries at Pantin and Bagneux, as well as the future square of Montmartre.

The second pavilion of the City of Paris is more especially consecrated to instruction. After attending to the healthfulness of matter, attention must be given to the healthfulness of the mind and moral culture. By the side of the models of the school-rooms, where children find school-furniture studied with painstaking care and proportioned to their stature, have been placed the works executed by the school-children themselves of every kind, primary, maternal and professional. These works, in a general way, prove an average aptitude for the industrial arts, and indicate a real taste for beautiful forms. A hall is wholly set apart for the pupils of the special schools. Finally, around the two pavilions are arranged the numerous statues, purchased, or ordered by the City of Paris, archers, halberdiers, officers of the watch of the fourteenth to the seventeenth centuries, and we recognize, as we pass, the "Sauveteur" of M. Mombur, the "Science" of M. Blanchard, the "Art" of M. Marqueste, and especially the proud "Porte-falot" of Fremiet, which decorates the lower part of the staircase of the new Hôtel de Ville.

PALACES OF THE LIBERAL AND FINE ARTS.

The two Palaces of the Fine Arts and the Liberal Arts are of equal dimensions and similar aspect. They cover an area of 21,000 square metres. They are composed of a large central nave, measuring 209.31 metres in length by a width of fifty-three metres and one-half. The nave is surrounded with galleries on the lower floor and first story. On the garden under the porticos are restaurants. Each of these palaces is connected with the Industrial section of the foreign countries by a large vestibule thirty metres wide by 115 in length, one of which, that of the Fine Arts, contains the exhibition of sculpture, and the other contains a large part of the musical instruments. These two palaces are entirely of iron, terra-cotta and ceramic work. The entrance is executed by a large porch of three arches, and the wings on either side are pierced by wide bays. Each is crowned with a dome fifty-five metres high and thirty-two in width. These two palaces are striking examples of the richness which can be introduced in a moment by the artistic employment of terra-cotta and ceramic work, especially when the ceramic artists bear such names as Müller, Lœbnitz and Parvillée, to say nothing of MM. Bráult, Boulanger and Mortreux, whose work we met in the ceramic division, or which we shall meet in our walks through the foreign pavilions. With M. Müller, who has given his name to a kind of brick covered with enamel on one of its faces, ceramic work becomes a portion of the very fabric itself as well as of its ornamentation. This principle applied with rare talent to the covering of the two domes of the palaces has given a very curious and interesting result. This covering is composed of enamelled tiles of more than 600 varieties which are not superposed one upon another, but butt together side by side, and form a mosaic rather than a covering of tiles. Each dome contains about 50,000 pieces arranged in ninety

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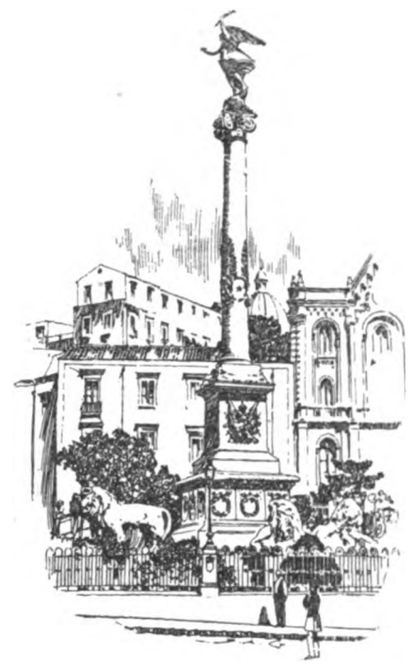
rows and twelve divisions. The general tone is blue. The principal ornamental motive consists of a cartouche which bears in the centre two large letters "R. F." in gold. The cartouche stands out on a background of cream-white, bordered with a meander. The effect is very brilliant and chatoyant. At the base of each dome twenty-four vases in pottery, three metres high, are arranged on the consoles of the attic which supports the roof, and in which are pierced bull's-eyes decorated in tones of blue and natural terra-cotta. The domes of the pavilions at the angle of the palace on the side of the Seine are in the same way covered with enamelled porcelain tiles. This is a new product invented by M. Parvillée and has a great decorative richness. Above each bay of the two palaces is repeated a terra-cotta frieze two metres high, which bears children holding cartouches and standing out from a golden background. Pillars between the bays are encased in terra-cotta fluted panels with interlacements of laurel and oak leaves. The ironwork of these pillars is exposed and encloses the terra-cotta work like a Spanish net, with very original effect and very interesting constructive frankness. Finally, the balustrade crowning each palace is also of terra-cotta, and is formed of small pilasters and between them is repeated a *motif* of bucklers bearing lions' heads. The balustrade is composed of 7,500 pieces and weighs 450,000 kilogrammes, and covers a space of 2,000 square metres.

Independently of the exhibit indicated by its name and character, the Palace of the Liberal Arts encloses one of the great curiosities of the Exhibition of '89; that is the "retrospective history of labor and anthropologic science." "The aim of this exhibit," said M. Jules Simon, in a report which he made as the president of the Superior Commission, June 15, 1888, "is to instruct the public in the history of the processes of manual and mechanical labor, which in the passage of centuries have resulted in the modern industrial utensils used in the arts and trades." This exhibit has a particularly historical and technical character. It is far from excluding objects of art, for in several ages the utensils, those especially which were used in the liberal arts, were veritable jewels, either from their elegance of form, or from the richness of their material, or the grace of their details. We find chefs-d'œuvre, for instance on a geographical map, on the handle of a chisel, on the barrel of a musket. Our ancestors were not possessed with the same passion for speed and cheapness that possesses us. Industry lost, perhaps, but the arts were the gainers. The aim of the retrospective exhibition is well defined. It is to retrace with broad strokes by means of the reproductions of diagrams and authentic monuments the stages of human genius. To achieve this result it was necessary to associate with the retrospective exhibition of labor that of anthropologic science, in order to show in the outset what man was when he left the hands of nature in the different physical forms of different races. The exhibit of anthropological science and history of labor comprises then five grand divisions — first, anthropologic and ethnographic science; second, the liberal arts; third, arts and trades; fourth, means of transportation; fifth, military arts.

The central nave of the Palace of the Liberal Arts is wholly occupied by this exhibit. Grand porticos and galleries of woodwork with platforms in the lower story, form four grand divisions with interior courts that approach by monumental staircases opening under the dome upon each side of the rotunda, which occupies the centre and shelters the theatrical exhibit. All around the porticos and galleries full panels were reserved upon which M. Charles Touché placed decorative compositions broadly treated in aquarelle illustrating, so to say, the history of labor.

An Ingenious Plan for Straightening Walls.— Yankees, as a rule, are equal to any emergency; what the average Yankee mechanic fails to conjure up at a time when his wits are most needed, leaves very little room for foreign genius to think and work in. Yet it remained for M. Molard, a French architect, to contrive an original and ingenious plan for straightening the walls of the Conservatoire des Arts et Métiers, which threatened an absolute collapse owing to the extreme weight of the roof. A series of strong iron bars were carried across the building from wall to wall, passing through holes in the walls, and were secured by nuts on the outside. In this state they would have been sufficient to have prevented the further separation of the walls by the weight of the roof, but it was desirable to restore the walls to their original state by drawing them together. This was effected in the following manner: Alternate bars were heated by lamps fixed beneath them. They expanded, and consequently the nuts, which were previously in contact with the walls, were no longer so. The nuts were then screwed up so as to be again in close contact with the walls. The lamps were withdrawn and the bars allowed to cool. In cooling they gradually contracted and resumed their former dimensions; consequently the nuts, pressing against the walls, drew them together through a space equal to that through which they had been screwed up. Meanwhile the intermediate bars were heated and expanded, and the nuts screwed up as before. The lamps being again withdrawn, they contracted in cooling, and the walls were further drawn together. This process was continually repeated, until at length the walls were restored to their perpendicular position. The gallery may still be seen with the bars extending across it, and binding together its walls. — *Philadelphia Record and Guide.*

LOSS OF POWER BY RADIATION OF HEAT.[1]



The Martyrs Column, Naples, Italy.

To him who holds the purse and pays for the coal consumed, it is of importance that between the energy of the burning fuel and the power developed by the engine there should be the least possible loss. Every unit of heat radiated by boiler-pipe, cylinder or heater is absolute loss, and must come out of that purse. In an electrical plant this matter is of great importance. There is less opportunity to have results obscured. There is, proportionally, a large possible loss between the coal on the grate and the far end of the cylinder, and this loss should be reduced to the minimum. Is it not always the best economy to throw away as little as possible, to save from waste *all* that can be saved? Is not the very *reason for being*, of the architect, the mechanical engineer, in fact of every man who is paid for his advice and direction, just this: that he shall bring to bear upon the subject, and impart to his client honest knowledge concerning the various matters about which he is consulted? That he shall keep abreast of the tide of discovery and improvement, and that upon these subjects he shall *know*, not trusting to mere hearsay or to unintelligent prejudice for his impressions.

Some little time since a gentleman from a neighboring city called upon me for information upon the subject of coverings in general and their comparative values. Being an intelligent man he said frankly at the outset that he knew very little on the subject. He had, however, in common with all of us, heard the word "asbestos" used as a shibboleth for years, but he desired definite knowledge, and after he had digested the information he should act on his judgment. I devoted sufficient time to him to put him in possession of the salient points of the subject. His understanding was acute. He left me to seek elsewhere further light upon this matter. After some few days he returned and directed that the magnesia covering be applied to his work. In the course of conversation he remarked that he had received great diversity of advice from those to whom he had gone. One man, who had been years in the business of selling steam plants, told him that the best thing for him to use was hair-felt, even though the steam-pressure might run up to 125 pounds to the inch. Now, as a matter-of-fact, the man who gave that advice simply showed himself an unsafe guide; and from his inability to keep abreast with modern knowledge, that he had no conception of the fire-hazard which his advice was to thrust upon the innocent inquirer, and that his advice was little short of being morally criminal.

The subject of the fire-hazard of organic coverings has been pretty thoroughly investigated and can be pretty well-known, when there is any inclination to get out of ruts which long years of travelling in has deepened. How many fires (cause unknown?) have really originated from the slow carbonizing of organic material on steam-pipes? It is but recently that the hair-felt covering on the steam end of a Worthington pumping-engine, within ten miles of us, not only burnt itself but destroyed some thousands of dollars worth of walnut lagging. Cases of the combustion of these organic coverings are numerous and are well-known.

Few appreciate the great loss of heat from uncovered or imperfectly covered pipes. Many have an indistinct impression that there may possibly be some slight loss. But there is in many cases an absence of knowledge upon this subject where it should be complete. The most correct data available show that the radiation from uncovered two-inch steam-pipe, with 60 pounds steam-pressure, is 391.83 kilo. centigrade heat-units one foot one hour, or 21,739.78 kilos. of coal for 100 feet per year of 300 days of 10 hours each; one kilo. equals 2,205 pounds. Properly combining these figures we see that there are 23.97 tons of coal lost by radiation from that uncovered pipe. If the coal costs $4 per ton, the radiation from this 100 feet of pipe will amount to $95.87. From the same pipe covered with Wm. Berkefield's fossil meal composition, $\frac{32}{100}$-inch thick, the most powerful inorganic non-heat conductor used as a covering at the time these investigations were made, there was

[1] Extracts from a paper read before the Boston Electric Club, December 23, 1889, by F. C. Child.

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radiated 24,109 kilo. cent. heat-units one foot one hour, or 1,337.63 kilos. of coal for the year. This would be $1\frac{474}{1000}$ tons of coal at $4 per ton, amounting to $5.89. Then $95.87 less $5.89 equals $89.98, the saving effected by covering this pipe with William Berkefield's fossil-meal composition $\frac{92}{106}$ of an inch thick. Or, in other words, the saving effected was over 93 per cent of the total possible radiation, using a thickness of one inch this loss would be reduced to $5.50.

From the same data we find (page 44) it stated that while the radiation through 25 m.m. of Wm. Berkefield's fossil meal was 7.7 heat-units, through 25 m.m. of carb. magnesia it was 6.7 heat-units, therefore the proportions 7.7 : 6.7 = $5.50 : $4.80 gives us the coal value of heat lost by radiation through the magnesia covering. To put this in another form: From the running-foot of two-inch pipe uncovered the loss is 96 cents, while, from the same pipe covered with the magnesia, the loss is less than five cents; or a saving of over 91 cents per year. To accomplish this saving the cost of the covering should be taken into account. This was 27 cents. Therefore, the investment in the magnesia covering is paid back in less than four months. The data which we have used were obtained by the use of a calorimeter measuring the quantity of heat passing through covering. The other possible method of arriving at this knowledge would be to accurately measure the condensation of the steam. In these experiments, owing to several reasons, it was not deemed advisable to rely upon the second method. Recently, however, I have seen in the *American Engineer* of June 12, a report of the proceedings of the Michigan Engineering Society containing a paper by Professor Cooley, of Ann Arbor, Mich., in which he says:

"The benefits of covering steam-pipes to prevent radiation are strikingly illustrated by the following example: The Thomson-Houston electric-light plant in Ann Arbor has about 60 feet of seven-inch pipe connecting the boilers with the engines and two large steam-drums above the boilers: in March, 1887, the steam at the far end of this pipe was tested to determine the amount of entrained water, the pipes and drums at the time being uncovered. An average of nine experiments gave 31.01 per cent moisture. In June of the same year, after the pipes were covered with magnesia sectional-coverings, the quality of the steam was again tested, the average of five experiments giving 3.61 per cent moisture; the tests were made by the same men from the same connections, and in the same manner. The pipes and steam-drums in March were subjected to a draught, which, of course, aided the condensation. Enough water passed into the cylinders to retard the engines, producing a disagreeable noise. In June the weather was warmer and the pipes and steam-drums were well protected. The quality of steam at the boilers was tested in June, and showed about three per cent moisture. Assuming that 100 incandescent horse-power were being developed at the time, and that each horse-power required 30 pounds of steam; if the steam is assumed to have 25 per cent entrained water due to condensation in the pipes and connections, then 4,000 pounds steam will need be produced in the boilers, or 1,000 pounds more than necessary. To produce this steam will require about 125 pounds of good coal per hour, or 1,000 pounds per day of eight hours. One-half ton per day at $3 per ton for 300 days, $450. The actual cost of the covering put on complete probably did not exceed $150."

An interesting verification of the remarkable non-heat condensing quality of the magnesia covering occurred at Lynn, Mass. In the heart of the district in that city, recently the scene of the disastrous conflagration, there was located the machine-shop of Messrs. Rollins & Glozier. A two-inch steam-pipe there was covered with this material. The heat of the fire at this place has been curiously determined to have been between the minimum extreme of 2,756° Fah. and the maximum extreme of 2,950° Fah., in this way: Cast-iron melts at 2,756° Fah.; wrought-iron at 2,950° Fah. A portion of the cast-iron bed of a lathe was fused into an irregular mass, and on it, partly imbedded, was a wrought-iron nut not melted. The steam-pipe spoken of fell a distance of 20 feet, and some of the magnesia covering was broken by the fall, but so effective was its heat-resisting and non-heat-conducting power that the pipe was found to be uninjured, and it is being used again in the building which is being erected to take the place of the one burned. That the magnesia should have endured the ordeal successfully was not unexpected, for we know that it is used by the Herreshoff Manufacturing Company as a lining to the shells of its coil boilers, and it is there subjected to a very intense heat resulting from the forced draught used in this type of boiler. Instances could be multiplied indefinitely, but I refrain from occupying further time with them, citing, however, one recent pertinent case.

The trial trip of the new cruiser "*Baltimore*" took place in the middle of September. It is reported to have been in many ways eminently satisfactory. The report goes on to state: "Another noteworthy fact was the comfortable condition of the fire and engine rooms. A duplicate crew had been provided with the expectation of relieving the firemen in two-hour turns; but after the first two hours of the run the first watch refused to quit work and insisted in running the ship throughout the entire four hours' trial." Boilers and all steam-surfaces were covered with the magnesia covering.

So it appears that not alone is the man who pays for the coal interested in this question of most perfect insulation, but also the men who operate the plant as well. In time, those architects, those mechanical engineers, those engine-builders and those other advisers, who are paid to advise soundly and correctly, and who are represented by our figure with the re-entering angles, will, of necessity, change their form and begin to assimilate these new facts, or ossification will so spread throughout the whole figure that they will be relegated to the shelf for curiosities as showing what strange geometrical forms the intellectual life of man may take.

THE COST OF A SMALL MUSEUM.

MORE than once we have endeavored to impress upon our readers the importance of collections of casts and other art reproductions as factors in popular education. It is only through these that the body of our people can ever hope to become familiar with the great masterpieces of European galleries, which have had so much effect upon the taste of the people among whom they exist, and might do a similar good work in this country were they only brought within reach. Doubtless there are many who join us in the wish that not only every large, but every small city might have its gallery of reproductions as well as its public library — a gallery in which children could grow up familiar with the noblest productions of Greece and Italy, in which the laborer could pass some of his holiday hours, and in which the mechanic could find the stimulus to make his own work beautiful as well as good. But the principal reason why such collections are not more numerous is probably that people have an exaggerated idea of their cost, and, among those who might best afford this, there are doubts as to whether an undertaking of the kind would be appreciated in any but the large cities.

Thanks to the liberality of Mr. W. A. Slater, the experiment has been tried in Norwich, Conn., and the results of the first year of the Slater Memorial Museum in attracting and holding popular interest have far exceeded the anticipations of its founder and his advisers. As it has been Mr. Slater's desire that the museum established by him should serve not only to educate his townsmen, but also to stimulate others who had the means to follow his example in other parts of the country, he has given us permission to make public the cost of his collections, which, we doubt not, will be a revelation to many. In August of last year we gave a long description of the Slater Memorial Museum, not then quite completed, from which it was evident that within the lines laid down by Mr. Slater, by which it was determined that the collection should contain only reproductions, and no original works, there were no restrictions as to expense. The works selected were to be the best of their kind, and were to be set up and arranged in the most effective manner possible. The number of objects was to be limited only by the size of the building.

The useful little catalogue of the casts in the Museum, prepared by Mr. H. W. Kent, the curator, to whom we are indebted for the figures which we shall quote, shows 124 numbers in the Greek and Roman section, and 103 in that of the Renaissance. Among these are some of the largest casts made, such as the selection from the Pergamon reliefs, the Nike of Samothrace and the Font of Siena. They were all made expressly for the Museum, and imported from London, Paris, Berlin, Munich, Florence, Rome, Naples and Athens. In addition to these, there is a complete collection of the British Museum electrotypes of Greek coins, handsomely mounted, and the nucleus of a collection of photographs, about 600, including the best plates of Braun, Naya, Brogi and other celebrated photographers. Most of the statues are mounted on revolving pedestals; two hundred and fifty of the photographs are exhibited in individual frames, the

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backs of which are movable, that the exhibition may be varied as often as desired; and, owing to the lack of wall-space, draperies have been hung extensively throughout the hall, the material of which is heavy raw silk. We mention these facts only to show that economy was not a consideration in the execution of the Museum, and believe that our readers will be the more surprised to learn that its *gross* cost to Mr. Slater — excluding, of course, the building itself — was exactly $27,112.97. Is there any city or college in the Union in which this sum could not be raised for a similar purpose?

The cost of the building we do not give, because it would be useful as showing how much, rather than how little, could be put into such an edifice. It contains, besides the museum proper, the floor-space of which amounts to about 10,000 square feet, a lecture-hall with a seating-capacity of about 1,200, a library and four large class-rooms, which, if the intentions of the founder are fully carried out, will be used for practical instruction in the fine arts. Desirable as all these rooms are in a building of the kind, the only one which seems to us absolutely necessary is the lecture-hall. To open a gallery like this to the public, and then leave people to float about in it aimlessly, without a notion of its meaning or its purposes, is to do but half the work. Either regular courses of instruction or occasional lectures upon topics connected with the theory or history of art are necessary in order to make the Museum anything more than a collection of curiosities to the uninitiated, and such lectures are given during the winter at the Slater Museum.

Of the amount just quoted, the principal item was naturally for casts. The cost of these, including packing and transportation, but not setting-up in the Museum, was $13,968.68, making an average of a trifle less than $62 for each number in the catalogue. We ought to say here, however, that an average is a dangerous guide in a matter of this kind, owing to the enormous difference in the size and price of casts, as well as in the distance from which they come. Obviously, too, the cost of packing and importing a few casts would be proportionately much greater than in a large order.

The casts once received, they must be put together, sometimes repaired and finally set up. Pedestals must be built for the statues, wall-spaces prepared for the reliefs. Therefore, a small force of skilled plaster-workers and carpenters is necessary. In Norwich most of the plaster-work was done by two men, a third being added occasionally, and the aggregate of this item in the expenses was $1,626.75. With regard to the carpentry, more work of this kind than would usually be necessary was required by the fact that a number of changes had to be made in order to adapt the hall to its use as a museum of art, its destination not having been determined when the building itself was completed. Consequently, some of the $4,690 paid for material and labor in this department would form a part of the building expenses in a structure designed especially for the purpose.

These were the principal expenses in the preparation of the Slater Museum. On photographs about $800 have been spent thus far, the electrotype coins cost something less than $750, and the balance of the total quoted was made up by such incidentals as the draperies and upholstering, photograph frames, the designer's commission and petty expenses.

Turning now for a moment to the other side of the balance-sheet, we shall try to answer the question, "Does it pay" to undertake a work of this kind, except in our large and central cities? If to the founder or founders of such an institution it be sufficient recompense for their liberality to see their gift used, appreciated and enjoyed by people of all classes, the brief experience of the Slater Memorial Museum answers the question with a strong affirmative. The Museum was dedicated on November 22 of last year. Since then it has been open regularly ten hours a week, divided among three days, and at other times to students and visitors from a distance. It is always free. There being no automatic machine for registering the admissions, Mr. Kent has requested visitors to write their names in a book provided for the purpose. The number who do so is naturally considerably less than the total number of visitors, particularly when the Museum is crowded, yet up to date the books show more than 10,000 names. The average attendance per week thus recorded, from the time of opening to July 1, was 283, the best month being December, in which 2,163 names were entered, the poorest June, with a total of 483. Especially gratifying has been the attendance on holidays, which shows that the interest in the Museum is by no means confined to those who have plenty of leisure. On Thanksgiving Day 800 names were registered, Christmas 932, New Year's 732, Decoration Day 850. For the benefit of the mill-operatives and other laborers who form the largest portion of the population of Norwich and the adjoining towns, to whom the Museum might do a world of good, we sincerely hope the day is not far distant when the building may be open at least a couple of hours each Sunday. The experience of the Boston Museum of Fine Arts in Sunday opening has been an unqualified success, and we wish that Norwich, as well as our own city, might profit by it. In Boston, we are told, the average number of admissions during the Sunday hours has reached as high as 1,000 per hour, and of these probably four-fifths are common workmen with their families.

These facts and figures regarding the Slater Memorial Museum are valuable only so far as they go. They show that the first problem of a museum — to interest the public at large — has there been solved successfully. More than that is not to be looked for yet. The ultimate good which the institution will accomplish can be but imperfectly manifested in one generation. It is from the children now growing up, from their children and their children's children, that the deeper results are to be expected. As the beginning has been made, we can afford to wait for the rest, which will come in good time. The lesson to be learned from it now is, that such collections are needed, that they are appreciated not by a few but by many, and that, so far as the cost is concerned, they are within the reach of every well-settled community. — *New York Evening Post.*

SANITARY ENTOMBMENT: THE IDEAL DISPOSITION OF THE DEAD.[1]

IN this country, partly because there were few places of large population, and partly because it was an early and general tendency to use cemeteries rather than churches, and the grounds adjacent to them, the evils of earth-burial did not manifest themselves so soon or in so marked a manner as in the Old World. But there were instances enough to convince the most incredulous that a radical change must be made. Dr. Ackerly, writing in 1822, thus describes the condition of the burial-ground connected with Trinity Church, New York, forty years before: "During the Revolutionary War this ground emitted pestilential vapors, the recollection of which is not obliterated from the memory of a number of living witnesses." In the same year, the *Commercial Advertiser* published an article in reference to the present evils of earth-burial at the same place, in which it was said: "It will be remembered that the graveyard, being above the streets on the west, and encompassed by a massive stone wall, and the east side being on a level with Broadway, it results that this body of earth, the surface of which has no declivity to carry off the rain, thus becomes a great reservoir of contaminating fluids suspended above the adjacent streets. In proof of this, it is stated that, in a house in Thames Street, springs of water pouring in from that ground occasioned the removal of the tenants on account of their exceeding fetidness." At a later date, Dr. Elisha Harris brought this telling indictment against the same place of interment: "Trinity churchyard has been the centre of a very fatal prevalence of cholera whenever the disease has occurred as an endemic near or within a quarter of a mile of it. Trinity Place, west of it, Rector Street, on its border, the streets west of Rector and the occupants of the neighboring offices and commercial houses have suffered severely at each visitation of the pest from 1832 to 1854." It seems hardly necessary to add that the foregoing statements are not intended to make the impression that there was a worse condition at the churchyard named than at any other. . . .

It may now be said: "Yes, this is all true, but we have changed all that! We no longer inter our dead in churchyards or burial-grounds within the limits of cities. We have provided cemeteries at great distances from our cities and large centres of population, and there the dead can do no harm."

To this the reply is easy and convincing: "that, if the dead endanger the living when the population is dense, they certainly also endanger them when the population is sparse. The danger is only diluted. It still exists, and it ought to alarm us just as truly when a few are imperilled as when many are." . . .

Not to attempt to tell all that has been ascertained, it will be sufficiently convincing to quote from Sir Henry Thompson's utterance in the *Nineteenth Century* in 1880: "I state, as a fact of the highest importance, that, by burial in earth, we effectively provide — whatever sanitary precautions are taken by ventilation and drainage, whatever disinfection is applied after contagion has occurred — that the pestilential germs, which have destroyed the body in question, are thus so treasured and protected as to propagate and multiply, ready to reappear and work like ruin hereafter for others. . . . Beside anthrax or splenic fever, spores from which are notoriously brought to the surface from buried animals below, and become fatal to the herds feeding there, it is now almost certain that malarial diseases, notably Roman fever and even tetanus, are due to bacteria which flourish in the soil itself. The poisons of scarlet fever, enteric fever (typhoid), small-pox, diphtheria and malignant cholera are undoubtedly transmissible through earth from the buried body." That

[1] Extracts from an address by Rev. Charles R. Treat before the American Public Health Association at Brooklyn, N. Y., October 23, 1889.

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the burial of a body that contains the seeds of zymotic disease is simply storing them for future reproduction and destruction is amply proved by the researches of Darwin and Pasteur, of whom the former has shown that the mould, or fertile upper layer of superficial soil, has largely acquired its character by its passage through the digestive tract of earth-worms; and the latter that this mould, when brought by this agency to the surface from subjacent soil that has been used as a grave, contains the specific germ of the disease that has destroyed its tenant.

It may now be asked: "Granting that these evils are inseparable from the burial of the dead in the earth or in tombs, what is the remedy? What else can be done?"

To this question not many answers can be given, because the modes of disposing of the dead have always been and must always be few.

Plainly, no such novel mode as casting the dead into the sea will be generally adopted. Plainly, also, the mode of the Parsees, grounded as it is in ancient, if not original use — to give the dead to beasts and birds — will not become universal. And, plainly also, cremation will not be welcome to the many, free as it is from objection on the score of public health, if a method equally sanitary, and at the same time satisfactory to a reverent and tender sentiment, can be devised.

The inquiry, then, has reached its limit; for, apart from the modes that have just been named, there are no others but earth-burial and entombment, and earth-burial, as we have seen, cannot be made sanitary under common conditions. Therefore, if the demands of affection and sanitation are both to be met, entombment is to do it, or it cannot be done.

Happily, better than any other method of disposing of the dead that has ever been devised, entombment has met the demand of affection. Never has any other mode so commended itself to men as this. There may have been at times a general adoption of cremation, and there may have been a general prevalence of earth-burial, but the one has not long satisfied the sorrowing survivors, and the other has owed its beginning and continuance to the apparent absence of alternative. Wherever the living have been able, and the dead have been dearly loved or highly esteemed, the tendency to entomb and not to bury has been constantly manifested.

To call attention to this tendency is enough to prove it, so easily accessible is the evidence and so familiar is its operation in the human heart. The most natural reference will be, first, to the mausoleum, the tomb of Mausolus, that was erected by his sorrowing Queen, Artemisia, at Halicarnassus, upon the Ægean's eastern shore, and that became at once one of the few great wonders of the ancient world. This was intended to do honor to the loved and illustrious dead, and this it did as no grave or pyre could do. This was also intended to protect the lifeless form from ruthless robbery and reckless profanation, and it performed this task so well that for near two thousand years no human eye beheld the mortal part of Mausolus, and no human hand disturbed its rest. At a far earlier time, Abraham, the Father of the Faithful, while he illustrated this tendency to entomb the dead, also offered an influential example to all who would do him reverence, as, in the hour of his great sorrow, he sought the seclusion and the security of Machpelah's cave for the last earthly resting-place of his beloved wife. There he buried Sarah; there he and his son and his son's son and their wives were all laid to rest, and the place of their repose hath not been violated even at this distant day. To this constant tendency constant testimony is borne by the massive and magnificent tombs in which India abounds, the tombs and pyramids that make marvellous the land of the Nile, the tombs that stood thick upon the Appian Way, and that rose superb upon the Tiber's shore, the modern use to which the Pantheon is put, the Panthéon at Paris and the Crypt of the Invalides, the Abbey of Westminster, matchless in memorials, the sepulchres within the hills that gird Jerusalem, and the sepulchre in which the Nazarene was gently laid when His agony was ended.

It remains to be considered whether entombment can be made sanitary. If it can be the problem is solved, for entombment has ever been the best that the living could do for their dead, and, with the added advantage of promoting, or ceasing to be prejudicial to, the public health, entombment will be the choice of all whom cost or caprice does not deter.

That entombment can be made sanitary is evident from the fact that in countless instances, in many lands and through long periods of time, it has been made sanitary by the ingenuity of man or by unassisted nature; and it is also evident from the fact that decomposition and disease germs are the dangers to be guarded against, and that against these both ancient and modern science have been able to guard. Not to enumerate all the modes that have been chanced upon or that have been devised by men, there are two that have been notable and are available for modern use — embalming and desiccation.

It is a delusion to imagine that embalming is a lost art; that, like some other marvels of the ancient time, this is a secret process that perished with the people who employed it. Did we desire it, we could embalm our princes and our priests, and retain their shrunken similitudes for distant coming times to gaze and gape upon, as skilfully as they who practised this art in Egypt's palmiest days. Nay, it is doubtless far within the truth to claim that better than they did we could do; and we are actually apprised of better methods and results than they employed or could attain, and it is not unlikely that we shall hear of better methods still. But Egypt's method, or its modern counterpart, will hardly now be popular. It involves too much mutilation and too much transformation. When it has done its work little is left but bone and muscular tissue, and these are so transfused with foreign substances that a form moulded from plastic matter or sculptured from stone could almost as truly be considered that of the lamented dead as this. Moreover, indefinite preservation of the dead is not desirable, and is not desired. The uses to which the Egyptian Pharaohs and their humbler subjects have been put in these days of indelicacy and unscrupulousness in the pursuit of science or sordid gain are not such as to make many eager to be preserved for a similar disposition when the present shall have become a similarly distant past.

Desiccation, in striking contrast with embalming, is the process of nature rather than of art, and involves no mutilation and no substitution of foreign substances for human flesh, and does not by unnatural means preserve the semblance of the human form so long that a susceptible sentiment is shocked and a due return of material humanity to the elements that gave it birth prevented. Desiccation is so far a natural process that it seems not to have been thought of until nature had done the work and shown the product, and through many centuries, and upon an extensive scale, nature had employed the process before it occurred to man to copy her and adopt her method for the disposition of his dead.

Wherever the air that enwrapped the lifeless form of man or beast was dry, desiccation anticipated and prevented decomposition. In deserts, upon elevated plains, upon the slopes of lofty mountain ranges, to which the winds that passed their summits bore no moisture, the dead have not decayed, but have dried undecomposed. In the morgue attached to the Hospice of St. Bernard, the dead, lifted too late from their shroud of snow, and borne thither to await the recognition of their friends, dry, and do not decay. In the "Catacombs" of the monastery of the Capuchins at Palermo, and in the "Bleikeller" at Bremen, the same phenomenon has appeared. Even Egypt is a confirmation of these statements, for it is probable that, had much less care been taken to preserve the dead, they would not there have yielded to decay as in other lands; and that moisture is so far absent from the atmosphere that the dead would have been preserved from decay by desiccation had not embalming been resorted to. Upon the elevated Western plains of this continent, the bodies of beasts and men by thousands have been preserved from decomposition by desiccation. To take one instance out of many that might be cited: A cave was not long ago discovered high up among the Sierra Madre Mountains, within which were found, where they had rested undisturbed for many years, the lifeless figures of a little aboriginal household, dried and undecayed. Father, mother, son and daughter, one by one, as death had overtaken them, had been brought thither, bound so as to keep in death the attitude that had marked them when at their rest in life, and there they bore their silent but impressive witness to the beneficent action of the unmoist air that had stayed decay and kept them innocuous to the living that survived them. In Peru, instances of this simple, wholesome process abound on almost every side; upon the elevated plains and heights, as also beside the sea, the dead of Inca lineage, with the lowliest of their subjects, are found in uncounted numbers, testifying that in their death they did not injure the living, because desiccation saved them from decomposition; and a recent traveller has vividly described the scene that a battlefield of the late war presents, and that illustrates the same process, where, though years have passed since the last harsh sound of strife was heard, the fierce and bitter combatants still seem eager to rush to conflict or to sink reluctant into the embrace of death. And all these instances furnish conclusive proof that decomposition can be controlled, and that its loathsome and unwholesome transformations can be prevented, if only the simple conditions are secured that have already so extensively effected this result. That these conditions can be secured no one can doubt, for, every-day, in almost every clime, by processes familiar and available to man, the atmosphere has moisture added to it or taken from it; and the extraction of the moisture from a portion of the atmosphere is all that is required to introduce the process of Peruvian desiccation into the sepulchres of Chicago or New York.

It will naturally be further asked: "Is this all that has been done to demonstrate the efficiency and availability of desiccation for the dead?" To this the answer would be sufficient that the evidence that has been adduced is ample, and that, at once, in perfect confidence as to the result, mausoleums might be erected, with provision for the withdrawal of the moisture from the atmosphere, and for the passage of the desiccated air through the sepulchres in which the dead should rest. So little is involved, and so much has been accomplished without the application of any human skill, that it seems inevitable that, as soon as the resources of modern architecture and sanitary science are drawn upon, the desired result will be at once attained. But, to make assurance doubly sure, several carefully-conducted experiments have been made, under the supervision of the directors of the New Mausoleum movement, that prove that the conditions of desiccation can be controlled and that decomposition can be prevented, that where it has begun it can be stayed, and that prolonged preservation, with a fair approximation to the appearance in life, can be made sure for the recognition of absent friends, for transportation or the furtherance of the ends of justice.

When, now, it is added that desiccation has been ascertained to be an efficient agent in the destruction of disease germs, as proved

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by the experiments of Dr. Sternberg, of the Hoagland Laboratory, and by the investigations of other experts, enough seems to have been said to establish the truth of the assertion that entombment can be made sanitary, and that, therefore, entombment offers the satisfactory solution of the problem how to dispose of the dead so as to do no violence to a reverent and tender sentiment, and at the same time not to imperil the public health.

The proposition, then, soon to be submitted for public approval is this: to erect in the suburbs of our large towns and cities, perhaps even in their most thickly-populated parts, extensive and handsome edifices that will provide sanitary sepulchres for the dead. To be comparatively inexpensive, they will have to be comparatively plain, and it seems not too much to hope that our cities will soon adopt this mode of disposing of the dead that depend upon the public care for burial, and that the horrors of a "Potter's Field," of which it cannot be divested, even in a fair and sea-girt isle, may be forevermore unknown of men. . . .

Within there would be, as the unit of construction, each sepulchre so constructed that anhydrous air could enter, or could be made to enter and withdraw, laden with moisture and morbific matter, which it would convey to a separate structure, where a furnace would complete the sanitary work that the anhydrous air had begun, and return to the external atmosphere nothing that would be noxious. Each sepulchre, in itself and its surroundings, would appear to provide a place of repose, and would have electrical appliances attached to it for the instant indication of the return of consciousness to any who had been prematurely entombed, and would promise and provide the most perfect and permanent protection against intrusion or theft that can be found on earth. In arrangement these sepulchres would have to conform to the price paid and the taste of the purchaser. Many would be like the single graves that thickly ridge portions of our cemeteries; many more would be grouped together after the semblance of a family-tomb; but in the general impression, in the surroundings and suggestions, the resemblance to the provisions of a cemetery would go no farther. For here there could be no burning sun, no chilling cold, no inclement storm; for the living, as they should pay the last sad honor to the dead, or in any subsequent tribute of affection, there could be no exposure, and for the dead there would be only the constant semblance of the comfort and the quiet of the best-ordered and most tranquil home. Thus, in providing the utmost that exacting affection and sanitary science can require, and in taxing to the utmost the resources of art, in architecture, in sculpture and in the use of subdued and according hues and forms for appropriate decoration, these "Campo Santos," or "Mausoleums," or "Mansions of the Dead," will seem to have realized the ideal disposition of the mortal remains of those who depart this life.

THE VERPLANCK HOMESTEAD, FISHKILL, N. Y.

The old Verplanck Homestead at Fishkill, Hudson River,
on which the Society of the Cincinnati are noted.
By A. J. Bloor
from Photograph
April 12/09

THE Verplanck homestead stands on the lands granted by the Wappinger Indians, in 1683, to Gulian Verplanck and Francis Rombout, under a license given by Governor Thomas Dongan Commander-in-Chief of the Province of New York, and confirmed, in 1685, by letters patent from King James the II. The purchase included "all that Tract or Parcell of land Scituate on the East side of Hudson's river, beginning from the South side of a Creek called the fresh Kill and by the Indians Matteawan, and from thence Northward along said Hudson's river five hundred Rodd beyond the Great Wappin's Kill, and from thence into the woods fouer Houres goeing"; or, in our speech, easterly sixteen English miles. There were eighty-five thousand acres in this grant, and the "Schedull or Perticuler" of money and goods given to the natives, in exchange, by ffrancis Rumbout and Gulyne Ver Planke sounds oddly to-day:

One hundred Royalls,
One hundred Pound Powder,
Two hundred fathom of white Wampum,
One hundred Barrs of lead,
One hundred fathom of black Wampum,
Thirty tobacco boxes, ten holl adzes,
Thirty Gunns, twenty Blankets,
Forty fathom of Duffils,
Twenty fathom of stroudwater Cloth,
Thirty Kittles, forty Hatchets,
Forty Hornes, forty Shirts,
Forty pair stockins,
Twelve coates of B. C.,
Ten drawing Knives,
Forty earthen Juggs,
Forty Bottles, Fouer ankers Rum,
Forty Knives, ten halfe Vatts Beere,
Two hundred tobacco pipes,
Eighty pound tobacco.

The purchasers were also to pay Governor Dongan six bushels of good and merchantable winter wheat every year. The deed is recorded at Albany in Vol. 5 of the Book of Patents.

Before 1685 Gulian Verplanck died, leaving minor children, and settlements on his portion of the land were thus postponed. Divisions of the estate were made in 1708, in 1722, and again in 1740. It is not accurately known when the Homestead, the present low Dutch farm-house was built, but we know that it stood where it now stands, before the Revolutionary War, and the date commonly assigned to the building is a little before 1740.

The house stands on a bluff overlooking the Hudson, about a mile and one-half north of Fishkill Landing. It is one-story and one-half high, of stone, plastered. The gambrel roof is shingled, descends low and has dormer windows. The house has always been occupied and is in excellent preservation. Baron Steuben chose it for his headquarters, no doubt for its nearness to Washington's headquarters across the river, and for the beauty and charm of the situation. It is made still further famous by the fact that under its roof was organized in 1783 the Society of the Cincinnati. The room then used is on the right of the hall, and is carefully preserved. In fancy we can picture the assembly of officers grouped about Washington, in that west room overlooking the river, pledging themselves to preserve the memories of the years during which they had struggled for their country's being.

The whole neighborhood, especially the village of Fishkill which was the principal settlement in the county at that date, has many revolutionary associations. The interior army route to Boston passed through the village; this was a depot of army stores, and workshops and hospitals were established. Here was forged the sword of Washington, now in the keeping of the United States Government, and exhibited in the late Centennial collection. It is marked with the maker's name, J. Bailey, Fishkill.

The New York Legislature, retiring before the approach of the British, after the evacuation of the city, came at last to Fishkill, and here the constitution of the State was printed, in 1777, on the press of Samuel Loundon, the first book, Lossing says, ever printed in the State.

Some years after peace was restored, the Verplanck family appear to have occupied the Homestead from time to time. Philip Verplanck, a grandson of Gulian the original grantee, was a native of the patent, but his public life was spent elsewhere. He was an engineer and surveyor, and an able man. Verplanck's Point in Westchester County, where Fort Lafayette stood during the Revolution, was named for him, and he represented that Manor in the Colonial Assembly from 1734 to 1768. Finally, Daniel Crommelin Verplanck with his large family — one of his sons being the well-known Gulian C. Verplanck, born here in 1786 — came to live in the old home permanently. He had led an active life in New York, served in Congress and on the bench, and now retired to the quiet of the country. It was he who planted the fine old trees which now shade the lawn; among them the coffee-tree so much admired. About 1810 the north end, built of wood, was added to the old house. Architects were not numerous, apparently, in those days, so the Dutch type was lost in making this large addition, though the interior is quaint, dignified and interesting. It was from under its roof that Daniel C. Verplanck was carried to his last resting-place as his father before him, and generations after him lived and still live in the old Homestead.

For the above description, prepared with no little painstaking, of an interesting house and demesne, as well as for the loan of the photograph from which I made my pen-and-ink sketch of it, I am wholly indebted to a member of the Verplanck family and a mutual friend.

A. J. Bloor.

Rock Upheaval Caused by Hydraulic Pressure. — There was a remarkable occurrence at the mills of the Combined Locks Paper Company at Combined Locks, Wis, on Saturday. From some unknown cause there was an upheaval of rock upon which the mills are located, throwing the mill walls out of place, cracking a great wall of stone and cement twenty feet thick and making a saddle-back several hundred feet long and six inches high in the bed rock beneath the mill. An artesian well two hundred feet away on the bluff has dried up. The damage to the mill and machinery will probably amount to several thousand dollars. The upheaval is supposed to have resulted from some hydraulic pressure between the seams of rock beneath. A panic occurred among the mill operatives at the time of the shake-up, but nobody was hurt in the stampede from the mill. — *Boston Transcript, September* 10.

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ELECTRICITY'S VICTIMS IN EUROPE.

Monument to Minine and Pojarsky, Russia.

ALTHOUGH the greatest number of deaths from electricity have occurred in this country — more than one hundred — of which twenty-two occurred in this city, yet other countries have not been without such "accidents," as has been erroneously stated by experts in the employ of the companies interested in the deadly high-voltage currents, and as the subjoined list, compiled by C. F. Heinrichs, the electrical expert, shows. The list is by no means exhaustive. Many European newspapers contain articles advising stringent measures to stop the causes of those accidents and the use of currents of electricity above six hundred volts.

Following is a list of victims of electricity in Europe:

In February, 1880, Mr. Bruno, the euphonium player at the Holte Theatre in Ashton, near Birmingham, touched the conductors of a two-light electric plant and received a shock which rendered him insensible, and he died within forty minutes.

In October, 1880, the stoker of the yacht Livadia, which was lying in the Thames, near London, was ordered to adjust one of the Jablochkoff candles. He accidently touched the terminals of the lamp, and instantly fell down dead. The difference of potential at the lamp terminals was only fifty volts, but it was admitted at the time that the wires must have been in contact with the iron plate upon which the stoker stood, and that alternating currents of higher voltages from the main source caused the death, because with fifty volts an electrical energy of only .05 Watts would have been expended on the resistances of the skin and the vital organs of the victim.

In 1880, a workman touched a wire of a Brush installation at the Hatfield House, the residence of the Marquis of Salisbury, and fell down dead. The current was under eight hundred volts.

In July, 1882, on the occasion of a fire in Brighton, England, a fireman took hold of a fire-escape which was in contact with the wire of a Brush machine. He received a shock which doubled him up and disabled him for a long time.

August, 1883, an official of the Hungarian railway in Pesth was killed on touching a wire of a "Ganz" alternating-current generator.

August, 1884, Emile Martin and Joseph Kenarec were killed in Paris on attempting to climb over the fence of the garden of the Tuileries. Both victims came in contact with the wires of a Siemen twelve-light alternating-current generator. The difference of potential between the place of the accident and the ground was 250 volts. The current which would pass that way caused the deaths, and burns upon the hands, cheek and ear of the victims.

September, 1884, Henry Pink, an attendant at the Health exhibition in London, was killed on touching a Hochhausen dynamo of 1,000-volt capacity. At that time all electricians agreed that no currents over 600 volts should be allowed.

November, 1884, an engine-driver, William Moore, was instantly killed on touching the wire of an arc-light plant, at Messrs. Bolcknow, Vaughan & Co.'s, works, at Middleborough, England. The fatality was admitted to be due to the high-voltage current and bad insulation.

January, 1887, Richard Grove noted that his employer's store, in Regent Street, London, was set on fire by electric-light wires. He rushed up on the roof of the building to cut the wires. He received a shock and fell off the roof, dead. Secondary currents of Goulard & Gibb's converters (Westinghouse system) were held responsible for the fatality by electricians.

December, 1887, James Williams was killed by an electric-light shock at the Pontyminister tin-plate works at Bisca, in Wales.

June, 1888, in Terri, Italy, a tinner was killed on the roof of a building on touching an alternating-current circuit.

October, 1888, in Spain, at the Valladolid electric-light station a carpenter took hold of a wire of an alternating-current generator and could not let go. An attendant tried to pull the man off the wire and both were killed by the currents.

November, 1888, E. A. Richardson, employed at the Consett iron works, in the county of Durnham, England, received a shock from an arc-light plant, from the effects of which he died two hours later.

December, 1888, in Turin, Italy, an employé of an electric-light company was killed by alternating currents.

June, 1889, John Connelly, an employé of the Siemens Electric-Light Company, near London, was killed by an alternating current of 1,000 volts.

Speaking of recent cases here, Mr. Heinrichs said:

"It is to be regretted that some of our electrical experts of so-called standing, not only assist in keeping the facts from the public, but tell when under oath only half the truth, as was said a short time ago in a conservative electrical publication in London. One of these experts had to admit in the Kemmler investigations that all of his knowledge as to the harmless nature of the Westinghouse current was obtained by him from observations made upon himself and friends receiving alternating currents from an electro-medical apparatus. And the various susceptibilities of the different living organisms to electric influences he judged from the manner in which some of his friends dropped the metal handles. Had this expert made any calculations of the electrical energy expended in these trivial experiments he would have found that the whole electrical energy expended upon the living organism of any of his friends was below one-fifty thousandth of an electrical horse-power per second, and the difference of susceptibilities of any of his friends was infinitesimal, and the difference of the electrical energy between the minimum and maximum charges less than one-two hundred thousandths of an electrical horse-power. It is a well-established fact that alternating currents of an electrical energy of one-four-thousandth part of an electrical horse-power per second, if expended upon the vital organs, the nerves and muscles, of any human being, will cause instantaneous death in every case." — *New York Commercial Advertiser.*

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF G. M. SMITH, ESQ., PROVIDENCE, R. I. MESSRS. STONE, CARPENTER & WILLSON, ARCHITECTS, PROVIDENCE, R. I.

[Gelatine Print issued only with the Imperial and International Editions.]

THE CATHEDRAL OF ST. MACHAR, ABERDEEN.[1]

"IN the bustling manufacturing town which has lately become, and is likely for some time to remain, the extreme northern point of our great system of railway communication, a venerable cathedral, surrounded by trees, with a pleasant river sweeping past it, is scarcely an expected sight. But the two divisions of Aberdeen — the old and the new town — are as unlike each other as Canterbury and Manchester. The old town, or "Alton," as it is locally termed, is not the most ancient part of a city of different periods, around which its modern streets and squares have ramified. It is a distinct hamlet or village, at some distance from the city, and edged away in privacy apart from the great thoroughfares connecting the manufacturing centre with other districts of the country. Its houses are venerable, standing generally in ancient gardens; and save that the beauty and tranquillity of the spot have led to the erection of a few pleasant modern villas, dotting it here and there, whoever treads the one echoing street of the Alton for the first time, feels that two centuries must have brought very little external change to the objects by which he is surrounded. In this pristine place, the short-spiked steeples, and the broad-slated roof of the old cathedral of St. Machar may be seen rising over a cluster of fine old trees which top the sloping bank of the winding Don, from the opposite shore of which the whole scene — comprehending the river, the sloping banks, the trees, and the gray old church — makes a very perfect landscape, rather English than Scottish in its aspect.

"A near approach develops something very peculiar in the character of this edifice. It bears throughout unmistakable marks of age, but none of decay. It is gray with the weather-wearing of centuries, but it displays none of the mouldering vestiges of Time's decaying fingers; nor yet has it that prim air of good keeping which shows, in treasured antiquities, that careful hands have sedulously restored each feature that age may have injured. It is clear that the completeness of detail — the clean outlines, the hard, unworn surfaces — are characteristics of innate strength, and connect themselves with the causes of a certain northern sternness and rigidity in the general architectural designs.

"The secret of all these peculiarities is to be found in the nature of the material, which is granite — the same that has handed down to us, through thousands of years, the cold, stony eyes of the sphynx,

[1] It should always be kept in mind that these Illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

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precisely as the chisel last touched them — and retains, to the wonder of the Londoners, the glittering lustre of the polished cheeks of Rameses. The stern nature of the primitive rock — obdurate alike to the chisel and to time — has entirely governed the character of the architecture; and, while it has precluded lightness and decoration, has given opportunities for a certain gloomy dignity. About the porch, one or two niches and other small details, have been decorated; but as if the artist had abandoned the task of chiselling his obdurate materials as a vain one, ornament goes no farther, and all the architectural effects are the fruit of bold design. Such, for instance, is the great west window — not mullioned, but divided by long massive stone shafts into seven arched compartments; such, too, is the low-browed doorway beneath, with its heavy semicircular arch. The upper tier of windows — here called *storm* windows, perhaps as a corruption of *dormer* — are the plain, unmoulded arch, such as one sometimes sees it in unadorned buildings of the earlier Norman period. Indeed, though the building dates from the second age of the Pointed style, it associates itself in some of its features, very closely with the relics of the Norman age, especially in the short, massive round pillars which support the clerestory. The roof, with its carving, gilding, and bright heraldic colors, is in thorough contrast with the rest of the architecture, and the eye gratefully relieves itself from the gloom below, by wandering over its quaint devices and gaudy hues. It is divided into three longitudinal departments, panelled with richly-carved oak; and at each intersection of the divisions of the compartments with the cross-beams, there is emblazoned a shield armorial, with an inscription.

"It is an uncommon thing to find, as in this instance we do, the nave only of a church remaining, for the chancel was generally the part first erected, and sometimes the only part. The remains of the central and eastern portions of St. Machar's tell how the western compartment braved the causes of destruction which to them had been fatal: they were built of freestone. Incrusted, as it were, in the eastern wall, are the clustered freestone pillars, with richly-flowered capitals, which of old supported the central square tower; and on either side are the vestiges of the transept, with the remains of the richly-sculptured tombs, represented in the accompanying plate, embedded in the wall. In Slezer's, and some other representations of this building in the seventeenth century, the tower — a simple square mass, with a roof — appears to have been still standing, but the choir had disappeared."

MONUMENT IN THE SOUTH TRANSEPT OF THE CATHEDRAL, ABERDEEN, SCOTLAND.

THE HOTEL DE SOTO, SAVANNAH, GA. MR. WM. GIBBONS PRESTON, ARCHITECT, BOSTON, MASS.

This hotel, which has just been completed, occupies a whole square in the heart of the city, and has a frontage of 300 feet on Liberty Street and 200 feet on Bull Street. It forms two sides of the square, the two-story kitchen and servants' wing forming the third side. The climate renders it desirable to have it freely open and exposed to the cool southeast winds which blow refreshingly up from the bay, and, as a winter resort, a southeast exposure of nearly half the rooms makes them sunny and dry. The building is four, five and six stories in height, and a flat roof, 50 x 70 on the highest portion, gives a fine view down the bay. A "solarium" is erected on this roof, to contain a tropical garden or to be used for dancing. The "parade" or garden, upon which all the southeast windows look, has been beautifully laid out, and there is not a dark room or a "back room" in the building.

A "rotunda" with glass roof at the rear of hall, first story, is intended as a lounging-room for ladies and gentlemen, and a veranda 35 feet in width in front opens upon Bull Street. Many of the rooms open upon covered verandas on the second, third and fourth stories. The dining-room is 50 x 120 feet, open to the air on three sides. The materials are local brick for the lower portions, and buff Perth Amboy brick and terra-cotta above. It contains about 300 rooms, and will cost, completed, about half a million. It is, except the Ponce de Leon, the largest hotel in the South. Special arrangements have been made for introducing large volumes of warmed or cooled air into the halls and corridors. The contractors are Mr. T. Lewman & Co. The Whittier Machine Co. did the elevator, heating and laundry work. The Brush system of electric lighting has been introduced throughout. L. Haberstroh & Son have decorated the walls and ceilings, making a special feature of the dining-room. Ground was broken just a year ago, and the house was opened for guests on New Year's day.

MEMORIAL CHURCH OF THE ANGELS, LOS ANGELES, CAL. MR. ERNEST A. COXHEAD, ARCHITECT, LOS ANGELES, CAL.

This church which has lately been finished has cost about $25,000. The inside walls are finished in brick and stone.

ST. AUGUSTINE'S ROMAN CATHOLIC CHURCH BUILDINGS, BROOKLYN, N. Y. MESSRS. PARFITT BROS., ARCHITECTS, BROOKLYN, N. Y.

[Additional Illustrations in the International Edition.]

CHATEAU DE JOSSELIN, MORBIHAN, FRANCE. — FACADE ON THE COUR D'HONNEUR.

[Gelatine Plate.]

AN INTERIOR IN THE CHATEAU DE JOSSELIN, MORBIHAN, FRANCE.

[Gelatine Plate.]

TWO VIEWS OF THE HOUSE OF MRS. CONSINO, SANTIAGO, CHILI.

DESIGN FOR CHURCH OF THE GOOD SHEPHERD, GOSPEL OAK, LONDON, N. W., ENG. MR. F. PHILLIPS FIGGIS, ARCHITECT.

BUTLER'S WOOD, CHISLEHURST, ENG. MR. ERNEST NEWTON, ARCHITECT.

HOUSE AT PENNSYLVANIA, EXETER, ENG. MR. JAMES CROCKER, F. R. I. B. A., ARCHITECT, EXETER, ENG.

This house has recently been completed for Mr. E. C. Philp, and stands in one of the best suburbs of the city. The materials employed are Wellington red brick for the facings above plinth, with Broseley tiles for the roofs, the few stone dressings being of Ham Hill. The walling up to the plinth level is of Westleigh limestone, as are also the piers surrounding the site, with wrought-iron railing between same. The principal chimney-pieces in the house have been made to special design, and are chiefly executed in American walnut and pitch-pine. The dining-room is panelled the full height up to a richly-modelled frieze in plaster, all to design, and the ceiling of this apartment is also panelled.

DESIGN FOR BOARD SCHOOLS. MR. GEORGE W. WEBB, A. R. I. B. A., ARCHITECT, READING, ENG.

This design was prepared in competition for schools near London, but, owing to a mistake in the date for sending in designs, it was too late for the competition. The plan is on the central hall system for boys and girls, the hall being 110 feet by 54 feet, and top-lighted. Fourteen class-rooms, each 30 feet by 20 feet, are provided, each divided from the central hall by movable glass screens. The infants' school, lodge, etc., form detached buildings. The total cost was estimated at £16,000.

METHODS OF REDUCING THE FIRE LOSS.[1]

The liability to injury by fire is a hazard inherent to all buildings, and this danger is a constant menace whose threatening destruction of values imposes upon the owner a persistent consideration, which endures as long as the building stands.

As every method of construction, the various mechanical processes and the stock in each stage of manufacture bears some relation to the fire-hazard as a supporter or possible originator of combustion, the engineer whose duties pertain to these matters must necessarily also consider the question of the fire-hazard in the important phase of prevention, as well as the direct application of those engineering problems required in the design and installation of fire apparatus.

The fire-loss is a most oppressive tax, much of which can be abated by the application of well-established means of prevention. In a practical sense, certain fires are to be considered as unpreventable, being caused by exposure to fires in other burning buildings, but there are very few fires whose destructive results might not have been prevented by the exercise of precautions entirely feasible in their nature.

These several topics will be considered in reference to the reduction of the fire-loss on isolated manufacturing property, because the exercise of every possible precaution may not avail anything if the property is liable to be imperilled by fires originating in adjacent buildings.

SUPERVISION.

The prevention of fires must in greater measure proceed from the efficiency of the supervision exercised over the property in the order of the buildings, heed to probable causes of fire, and attention to the fire-apparatus.

In a manufactory there is a wide distinction to be made between to-day's dirt and yesterday's dirt; valuable results may be obtained by an inspection of the whole property made on Saturday afternoon

[1] Abstract of a paper by Mr. C. J. H. Woodbury, read before the American Society of Mechanical Engineers.

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by two men, such as foremen or overseers of rooms, who may be appointed to serve four weeks, their assignment terminating on alternate fortnights. The report should be made on a sheet of paper, divided so as to include all features of order and fire-apparatus in every room.

As property should be watched during the day Sunday, as well as at night, it is under the care of watchmen about five-eighths of the time, and the measure of this responsibility should be clearly understood.

The patrol should be recorded on a watchman's clock, not merely to show that he was not unfaithful, but also to prove that he was faithful.

Especially in districts liable to disorder and lawlessness, it is desirable to have a district-messenger signal-box in the works, visited once an hour, with the understanding that if the call is not made within fifteen minutes of the appointed time, it will be assumed that there is trouble and help sent at once.

Safety requires that the lanterns should be securely guarded; that the handle and sustaining parts of the lantern be connected together by rivets or by locking the metals together without relying on soldered joints; and thirdly, that the lamp should be put in from above, and never from the bottom.

CONSTRUCTION.

In its design, a mill for any standard line of manufacture is not a building whose arrangements and proportions are fixed upon at the whim of the owner, but it must conform to certain conditions of dimensions, stability, light and application of power to satisfy the requirements essential for furnishing every advantage necessary for producing the desired results at the lowest cost.

The destructive consequences attending fire in such buildings, whose iron and masonry construction is called fireproof, show that some other form of construction is necessary to obtain the desired results of minimizing the annual cost of the maintenance of the invested capital, as represented by insurance, depreciation, interest and taxation. There is little incentive for entering into unusual expenses in the construction of a manufacturing building for the purpose of increasing its resistance to fire, unless the additional interest on such increase in the investment is to be met by a corresponding reduction in the annual cost of the fire-hazard. In addition to these questions, involving the annual maintenance of the plant, the increase in the expense of the building above a certain point may prove poor management, by locking up capital for too long a time, and may tend to prevent the improvements in arrangement and construction which are necessary for the most advantageous manufacturing.

The method of mill building known as slow-burning construction combines the advantages of low initial cost and great resistance to destruction by fire, the final result being that the manufacturing is housed at the minimum annual cost. The fundamental principle of such construction is to mass the material in such a way that there shall not be any concealed spaces about the structure, and that the number of projections of timbers, which are more easily ignited than the flat surfaces, shall be reduced as far as possible; that iron portions of the structure shall not be exposed to the heat of any fire in the contents of the building, and furthermore, that the isolation of the various portions, both in respect to that of one building to another and of the various rooms and stories of the same building, shall be as complete as is feasible.

The most important feature is that of the mill floors, which should be laid on beams, generally of Southern pine, 12 x 14 inches, or two inches larger when required by unusual loads or longer span than twenty-two feet. These beams are placed from eight to ten feet apart between centres.

At the columns, beams rest on cast-iron caps.

The support from one column to the next should be made by cast-iron pintles, preferably those whose section is in the form of a Greek cross, as that presents advantages in the way of securely joining them to the timber beams. At the top of the pintle, a cast-iron plate should support the base of the column above.

Timber columns are preferred to those of iron, unless the load is greater than can be sustained by timber.

The floor planks for this type of floor are generally made of spruce plank from three to four inches in thickness, grooved on both edges and joined together by hardwood splines. These floor-planks should be two bays in length, breaking joints at least every four feet.

Above this the top floor, of $1\frac{1}{4}$ or $1\frac{1}{2}$ inch hardwood, is laid, and in some instances the resistance of the floor to fire is greatly increased by laying a coat of plaster on the floor-plank before the top flooring is built. But the general method of increasing the resistance of the floor to fire is by covering the floor and beams on the under side with plaster laid on wire-lathing.

Such a mill floor and columns, while possessing in a very high degree features which offer resistance to the fire, being weakened by the temperature only to a slight extent as they are slowly burned away under the exposure to a very severe fire, also possess the merit of great economy, both as regards the low price of construction, and in that the floor is thinner in comparison with joisted floors of equal strength, saving in this respect, for every floor in a building, about ten inches in height of wall, stairs, belting, steam-pipes, and all vertical connections reaching from floor to floor, a saving which amounts to considerable in the total cost of a building.

The division of mills into various portions by means of fire-walls is frequently not so efficient as assumed, by reason of the lack of fire-doors to satisfactorily fulfil the purpose of resisting fire. The best form of fire-door is that made of two thicknesses of matched boards, placed at right angles to each other and nailed together, being covered on the outside with tin, securely locked together and held to the door by numerous hanging-strips. The door should be secured to the hangers by means of bolts, and not screws, and the rail upon which it runs strongly bolted to the wall. When closed, such a door should fit into a jamb and be securely held in this manner against the wall. Such doors are frequently hung upon an inclined track, and, by some application of highly fusible solder at the catch, are so arranged that they will be closed by the heat of a fire, if not closed by hand.

In this treatment of the arrangement of buildings to resist fire, consideration has not been given to the cost of land, which is, of itself, an important factor in determining what arrangement will be the most expedient for an establishment. Where land is expensive, or there are limitations in the space suitable for building, it is frequently necessary to build mills and shops higher than would be warranted by good judgment under other conditions; but where circumstances will permit it, the one-story mill has been very successful, not merely in immunity from fire, and very low cost per square foot of floor, but also in the advantages of manufacturing, particularly in regard to cost of supervision and movement of the stock in process of manufacture. These are questions which must be determined, not merely in regard to the various processes of manufacture, but the individual needs of each concern; the position of the fire-risk in the matter being that the hazard of a building increases very rapidly with its height, and to some extent with its area.

The extension of one-story buildings over too large an area will not be commended, and certainly, as regards the question of fire, it has a tendency to place too large a property in direct exposure to a very wide hazard.

Some textile mills have been built in the form of the block letter U, this form having been decided upon as giving the conditions of lowest resultant cost. One wing, two stories in height, contains weaving; the other wing, three stories in height, contains carding and spinning, while the engine is placed in the connecting building. The pickers and the boilers are in outside buildings, so placed that they will not interfere with future extensions of the building into the form of the block letter H.

FIRE APPARATUS.

All methods for the prevention of fires fall so far short of the ideal of immunity that there is a necessity for fire-apparatus. The principle of the defence of a manufactory against fire is that of self-protection, by making the installation and management of the fire-apparatus equal to the progress of any fire which can possibly occur.

Fire-apparatus should be kept in service as well as in order. It is no exception to any other machinery, in that practice is essential to obtain any efficient results.

The practical results of private fire-organizations, where fire has occurred, have been very marked; and systematic and skilful work has been the rule, in place of the needless confusion and liability to breakage of the apparatus, which almost inevitably occurs in the lack of such organization.

The details differ with the arrangements and administration of every mill; but the general policy of definitely assigning persons to the positions for which they are best adapted, and where it is presumed they could be most useful, and to practice them in such work, is a rule which is common to all.

A great deal of fire-apparatus is destroyed by freezing water during the winter months, and therefore a special inspection of all such apparatus should be made late in the autumn, when the water should be drained from all portions of the system where there is liability of freezing, and all hydrants and valves should be well oiled, preferably with mineral oil. The hazard from a hydrant or other portion of the apparatus broken by frost, does not lie so much in the probability that disadvantage may result from the disuse of one element of the plant, as in the liability that such a breakage may interfere with the whole system and render it inoperative.

Buckets of water are the most effective fire-apparatus. They should be kept full, and distributed in liberal profusion in the various rooms of a mill, being placed on shelves or hung on hooks, as circumstances may require. In order to assist in keeping them for fire purposes only, they should be unlike other pails used about the premises, and in some instances each pail and the wall or column behind its position bears the same number.

Automatic-sprinklers have proved to be a most valuable form of fire-apparatus in operating with great efficiency at fires where their action was unaided by other fire-apparatus, particularly at night. In mill fires the average loss for an experience of twelve years shows that in those fires where automatic-sprinklers formed a part of the apparatus operating upon the fire, the average loss amounted to only one-nineteenth of the average of all other losses. If the difference between these two averages represents the amount saved by the operation of automatic-sprinklers, then the total damage from the number of fires to which automatic-sprinklers are accredited, as forming a portion of the apparatus, has been reduced six and a quarter million dollars by the operation of this valuable device.

Although there have been numerous patents granted to inventors of automatic-sprinklers since the early part of the present century,

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yet their practical use and introduction has been subsequent to the invention of the sealed automatic-sprinkler by Henry S. Parmelee of New Haven, Ct., about twelve years ago. This device being the first, and for many years the only automatic-sprinkler manufactured and sold, and actually performing service over accidental fires, to him belongs the distinction of being the pioneer, and practically the originator, of the vast work done by automatic-sprinklers in reducing destruction of property by fire.

Although nearly or quite 200,000 Parmelee automatic-sprinklers have been installed, their manufacture has been supplanted by other forms; and the total number of automatic-sprinklers in position at the present time must be about 2,000,000.

When automatic-sprinklers were first introduced there were many apprehensions that leakage, and also excessive water discharged upon small fires, would be sources of damage. In England this opinion found expression in increased insurance rates in buildings where automatic-sprinklers were installed.

The logic of figures shows that this liability to damage is merely nominal in the case of well-constructed sprinklers. An association of underwriters who have given careful attention to the subject obtained the facts that from the automatic-sprinklers installed in some $500,000,000 worth of property insured by them, the average damage from all causes, except fire, was $2.56 per plant per annum.

Although automatic-sprinklers have proved to be so reliable and effective, yet, in order to provide for all possible contingencies, their introduction should not displace other forms of fire-apparatus, particularly stand-pipes in the stairway towers, with hydrants at each story. The hose at these hydrants should be festooned on a row of pins, or doubled on some of the reels made especially for such purposes. Stand-pipes are not recommended to be placed in rooms or on fire-escapes; and inside hydrants should not be attached to the vertical pipes supplying automatic-sprinklers.

Fire-pumps are generally too small for the work required of them, 500 gallons per minute being the minimum capacity recommended. For a five-story mill there should be an allowance of 250 gallons per minute for an effective stream through a 1¼-inch nozzle, and for lower buildings the estimate should rarely be less than 200 gallons for each stream.

Contrary to the general assumption, a ring nozzle is not so efficient as a smooth nozzle, the relative amount of discharge of ring and smooth nozzles of the same diameter being as three is to four. For stand-pipes ¾-inch nozzles are recommended, but for yard hydrant service the diameter should never be less than one inch, and 1½ inches generally fulfils the conditions of best service.

The yard hydrants should be placed at a distance of fifty feet from buildings, and covered with a house which should also contain hose, axes, bars, nozzles and spanners.

Water-mains about a mill-yard should be of ample capacity not to cause an excessive loss by friction, their diameter being based upon a limit of velocity of ten feet per second for the maximum delivery.

RESULTS.

These methods of supervision, building and equipment do not refer to any ideality, but to measures which have been widely carried into effect for the purpose of reducing the fire-loss; the result of such action being to diminish the cost of insuring industrial property engaged in such normally hazardous processes as textile manufacture and other industries, down to a yearly cost of less than one-fifth of one per cent. This has been accomplished by the consideration of sources of danger and their abatement, and by a course which has been in line with sound engineering principles, and also practical methods of manufacture; and it has thus been proved that it is cheaper to prevent a fire than to sustain a loss.

There has been no attempt made to credit individuals with their share in these features of mill development. They have been the outgrowth of a continual profiting by experience, adopting some features and modifying others. The concurrent action of the large number of minds engaged on the same problem has led to duplication of methods; but the whole progress has been a matter of slow, steady growth, advancing by hairs' breadths, as the result of persistent efforts to adapt means to ends in the endeavor to reduce the cost of manufacture.

SOCIETIES

THE NEWARK ARCHITECTURAL SKETCH-CLUB.

AFTER a preliminary meeting held for permanent organization December 14, 1889, a constitution and by-laws were adopted, and the following officers elected: *President*, W. Frank Bowers; *Vice-President*, J. C. Swinnerton; *Secretary*, H. A. Hickok; *Treasurer*, W. C. Hudson. *The Executive Committee* consists of F. S. Sutton, A. E. Hudson, W. G. Smith, L. A. Virtue and E. K. Taylor, together with the officers. It is intended, in addition to the usual monthly competitions, to make a special feature of regular class-work throughout the year, this will consist of courses in constructional work, free-hand drawing, water-color work, plumbing, architectural history, etc. The courses will be under the direction of specialists in the various branches who are club-members. Applications for membership will be received by the Secretary, whose address is 762 Broad Street, Newark. The Club expect to have permanent quarters soon, which will be open every evening to members.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

AGREEMENT BETWEEN ARCHITECT AND CLIENT.

Albany, N. Y., December 26, 1889.

To the Editors of the American Architect:

Dear Sirs,— As the services which an architect is supposed to render his client and the compensation for same have been the subject of considerable loss to us through misunderstanding, we have prepared for use the enclosed proposition, which covers most cases in our general practice. In work of such a nature as can't be covered by this proposition, we prepare one specially suited to the occasion, but in all cases insist on a written agreement which we consider is fair to both parties. Should you see in this proposition anything of benefit to the profession, you are at liberty to use same.

Yours truly, Fuller & Wheeler.

Office of Fuller & Wheeler, Architects,
No. 86 State Street, Albany, N. Y.,—— 189 .

PROPOSITION.

Mr.——

We will prepare for you the Preliminary Sketches, General Drawings, Details and Specifications for proposed ——
to be erected at ——
for 3½ per cent on the actual cost of same, which is to be determined by the amount of Mason, Carpenter, Roofer, Plumber, Stone-cutting, Heating, Ventilating, Iron-workers, Mantel and Elevator Contracts, including all extras and deductions. In connection with Heating, Ventilating and Elevator, we will either select the apparatus and approve the specifications as submitted by the dealers, or prepare plans and specifications for contractors to estimate on, according to the character of the work in contemplation, and as in our judgment will secure the best advantage to you. The cost of hardware, mantel facings, hearths, back linings, metal bands, electric work and decorations are also to be included in the total cost of said building, but we are not required to perform more than our customary work in connection with the last mentioned items, which is either to select them from manufacturers' stock or have submitted to us samples, sketches and specifications from which a selection is made. Any other work, not mentioned above, that we may be called upon to perform will be charged for at the same rates.

SUPERVISION.

We agree to professionally supervise work constructed from our plans, for an additional 1½ per cent, or 5 per cent in all, where the work is in the city, and inspect work out of city at the same rate per cent, visits not to exceed 2 per month. In any case where a Clerk-of-Works is required, either on account of the magnitude of the job, or the inefficiency or carelessness of the contractors, the cost of same is to be paid by you in addition to our compensation for supervision or inspection, and said Clerk is to be approved by us.

We do not agree to be responsible for the acts of the Clerk-of-Works, or for the negligence or violations of contracts by the contractors any further than we can reasonably detect at the time of our visits of supervision or inspection; but such negligence or violations of contracts, as we detect, we will have corrected, so far as the power vested in us will permit and as speedily as possible.

You are at all times to consult with us about desired changes or additions to the work; to order all such changes through us; and to notify us in regard to any work done or material used that you consider is a violation of the contract.

No allowance from our percentage will be made for drawings contracted for and not furnished, except upon a refusal by us to furnish such as may be necessary.

The supervision and inspection contemplated by this agreement, is such as is calculated to and ordinarily will secure the furnishing of materials of the kind and quality required by the contract, and the performance of the work in accordance with the plans and specifications, and in a good, workmanlike and substantial manner.

CERTIFICATES.

Where the work is under our supervision, or inspection, we will issue certificates of indebtedness to the contractors, as per terms of contract. The final certificate being an adjustment of the contract and extras, and also an expression of judgment on our part that the work has been carried out according to the general drawings and specifications and contracts by the contractors, but is not to form a legal obligation on our part.

If the building is not erected from said plans, the charges, instead of being based on the actual cost, will be based on the approximate cost, which is hereby estimated at $——, although the last-mentioned sum is not guaranteed to be the actual cost of said building. Should the actual cost exceed the approximate cost, we will make the necessary changes in the plans, so as to reduce the cost, should you so desire, without extra charge. Changes made in plans from other causes, charged for according to time consumed.

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Travelling expenses and other necessary disbursements in addition to fee for services.

PAYMENTS.

Payments shall be made as follows: Upon completion of the preliminary sketches, 1 per cent of estimated cost; upon completion of the general drawings and specifications, an additional 1½ per cent of estimated cost; upon completion of details an additional 1 per cent of estimated cost; and upon completion of the work, the charge for supervision or inspection. At that time, also, any differences between the percentage upon the estimated and actual cost is to be settled, and any deficiency is to be paid or excess credited.

Travelling expenses and other necessary disbursements are payable when incurred.

In case contracts are not entered into for the work within six months after the drawings are ready for contractors to estimate, payment shall be made for the work done at the rates herein before specified, computed upon the estimated cost. Provided, however, that if at any subsequent time the plans and specifications prepared by us, are used and the actual cost exceeds the estimated cost, compensation upon such excesses, shall be made at the rates aforesaid.

REMARKS.

Respectfully yours,

Accepted,—— 189

INSPECTION OF BUILDINGS IN NEW YORK.

NEW YORK, N. Y., December 22, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— In your issue of the 21st. I note an editorial setting forth how the New York City Health Department trapped an ingenious builder, who piped his sewerage into his back-yard, and I, and, I think I can safely say, many other architects of New York, would ask why you omit, when publishing such facts, to mention that such work was so put in and is continually put in, in as bad or in a very unworkmanlike and insanitary manner, under the supervision of the same department, and thus shows how the paid officials and inspectors whose business it is to pass upon and approve the plans and specifications and to give continual inspection — to see, examine and test every length of pipe and every joint; who have the might of the law to strike down the offender who shall make bold to violate their mandates, fail to give protection to the innocent owners and purchasers of property, or curb the avaricious hands of unscrupulous builders and careless workmen.

I should like further, to ask you to publish to the New York City public, the fact that the "Department," the "Health Department," with its Bureau of Plumbing and Light and Ventilation, and the Building Bureau of the Fire Department, are unable to protect property owners and purchasers from errors in sanitation and construction, as they are supposed by too many to do. Owners frequently think that unless they want "fancy" drawings and fronts, an architect is superfluous. The "speculator" finds it no advantage, but rather the opposite, to have an impartial judge between owner and contractor, or a close inspection over his subs; as he gains little by the fact of his having employed a thorough architect, when he comes to sell, and loses by the bill for services and the legitimate price he pays for honest work.

The bulk of speculative work done in New York is after the most trivial plans made by some mere draughtsman or carpenter, and the "superintendence" is under the "keen" eye of the builder and owner — who is usually one and the same individual and who has made a definite failure at all the branches of the trade and frequently many others, and now holds position as owner of the property by virtue of his having paid, entirely in mortgage, for the same. In the large majority of cases that have been under my observation, they are entirely incapable of passing an intelligent opinion on any of the materials and work that make up a building, or at least on very little, and the gross impositions practiced upon them by their sub-contractors is startling. Their work is covered-in and is so left, I doubt not, in the majority of cases, as the inspection furnished by the "Department" is entirely inadequate for proper protection. The confidence of the public is continually bolstered up by such descriptions as the editorial above mentioned. A NEW YORK ARCHITECT.

A SEEMING ATTEMPT TO DEFRAUD AN ARCHITECT.

PITTSBURGH, PA., December 30, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,— Please answer through the columns of your valuable journal the following:

I will designate A as the party for whom I drew plans, etc., B as the owner of property adjoining, and C as the contractor for A. I drew up plans and specifications for a 60′ 0″ front by 60′ 0″ deep building for A, including party-wall for A and B who has 35′ 0″ front by 60′ 0″ deep lot. I was employed to render full services, such as to draw up plans, specifications, details and superintend the construction of said building for A.

A wrote to me asking me whether I would allow B to use my plans and specifications to be copied. I answered, emphatically, that not under any circumstances would I allow it without compensation, as the plans, etc., were my property, and were only designed for A.

A let the contract for erection and completion of the building to C, I having made the articles of agreement for same.

In the meantime I was notified that B and C were taking sub-bids for the erection of the 35′ 0″ building, all with my plans and specifications. They were taking the sub-bids from the same parties that were to do the work for C on the building for A. B let C build the 35′ 0″ building.

I notified B and C that I will collect my commission on the construction and completion of their building, to which notices I have no reply.

The 35′ 0″ building was commenced at the same time as the building for A; my plans, specifications and details were used for the building by the same sub-contractors, etc.

The buildings are now nearly complete, and the building for B or the 35′ 0″ building is a portion of the building designed for A with slight variations made by C.

I think the above to be very explicit; and now, gentlemen, I would like to ask you for your opinion as to my compensation, and to what extent I am entitled to it.

Yours very respectfully, F. C. SAUER.

[WE think that you are entitled to the full commission of five per cent on the cost of the 35-foot building, and believe that you can collect it. — EDS. AMERICAN ARCHITECT.]

VENTILATING WOODEN COLUMNS.

ZANESVILLE, O., December 23, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — We notice that in buildings in the East for factory purposes, all wood columns have a hole bored through the centre for ventilation. What size should the hole be for 12″ x 12″, 10″ x 10″ and 8″ x 8″ posts. Also size of cross holes for the purpose of communicating with vertical hole, and how far from ends.

Respectfully yours, A. E. PILING CO., LTD.

[WE have referred this to Mr. C. J. H. Woodbury who replies that the method followed by the best mill-builders is to bore a hole along the axis one and three-fourth to two inches in diameter. The method formerly used was to bore the hole in half-way from each end after the column was finished, but as the auger would follow the grain of the wood, the holes would not always meet, and running out nearer the side of the column would produce structural weakness which has been revealed in tests of columns whenever destructive tests of such columns have been made. The better way is to arrange a lathe with a hollow head-stock and a guide which will carry a pod-auger boring in from one end. This will define the axis of the column whether it is to be turned or left square. Near each end, say five inches, a couple of transverse holes generally five-eighth of an inch in diameter are bored. This arrangement is to reduce and in some cases prevent checking in the same way as has been used, time immemorial, for getting out hubs for wagon wheels. — EDS. AMERICAN ARCHITECT.]

BOOKS IN WATER-COLOR PAINTING.

SPOKANE FALLS, WASH., December 11, 1889.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — Will you kindly advise, through the columns of your paper, what is the best self-instructing work on architectural water-coloring, and oblige INQUIRER.

[THE best drill for the eye and hand that we know of can be obtained in the shortest time by getting Ruskin's "*Elements of Drawing*," and doing faithfully and exactly all the exercises which he prescribes, including both those in black-and-white and color. Many people, however, do not care for this drill, but prefer to make a few bad imitations of simple chromos, and consider that equipment enough for architectural work. For those, Penley's large work, the "*System of Water-Color Painting*" is the best for copying from; or the aspirant may get some of the little Winsor and Newton "*Handbooks on Sketching in Water-Colors*," to show him how to choose and mix his pigments, and use as models to copy from some of the colored prints of architectural subjects which are to be picked up in the stores. There is a good deal of choice among these. We have ourselves published one or two, from originals by Mr. Rotch, which will answer as well as anything we know, being admirable in color and architectural feeling, and just sketchy enough. Pains should generally be taken *not* to make an elaborate picture of an architectural sketch, and the processes preliminary to making a highly-finished water-color painting, such as laying a ground-color of neutral orange, and sponging it partly out, cutting out foreground lights with a knife, and so on, are best dispensed with. Chinese white, also, should be used very sparingly, and only where the scale is so small that it appears in the form of dots. A good lesson on the importance of keeping color subdued, for the sake of heightening architectural effect, can be derived from any of Prout's works, which, by the way, might with great advantage be used to copy from. These will show the value of what most students consider beneath their notice — work in two tints and give the best models possible of artistic distribution of light and shade. — EDS. AMERICAN ARCHITECT.

NOTES AND CLIPPINGS

THE DUTY ON GLASS AS IT AFFECTS CONSUMERS. — In a letter to the *New York Times*, Mr. J. S. Moore writes: As I am on the subject of glass, and as the members of the Pan-American Congress are inspecting our magnificient metropolis, I wish to call their attention to two subjects. First, our dirty streets, and second, our splendid windows. Dickens has immortalized the "Golden Dustman." In this city we have the "Dirty Ringman," or we may say "Ringmen." There have been millions in New York's dirty streets. The most honest and persevering Mayors and other high officials have got stuck in New York

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street mud and were never heard of again. Our aristocratic home mud has flourished without any protection, and the pauper mud of Europe or any other mud could never beat our home product. Here our amiable and friendly Commissioners of the Pan-American Congress can see it demonstrated that our mud industry can flourish without protection. I will now call the attention of our Pan-American friends to the windows in New York houses. They are invariably of plate-glass, and there is not a city in the world that can beat New York in handsome windows. Now, then, it is an actual fact that the tax or duty on plate-glass is as follows: Plate-glass, 10 by 15 inches, 3 cents per foot, or 13.60 per cent; plate-glass, 16 by 24 inches, 5 cents per foot, or 19.78 per cent; plate-glass, 24 by 30 inches, 8 cents per foot, or 27.46 per cent. Now, we must admit that this is a moderate tax. The above glass goes into the houses of the rich. Of course, it will not do to tax influential and rich citizens. But now let me show how we tax that class of people who build three-hundred-dollar houses, or the hundreds of thousands of farmers who live in the far West. Those houses are glazed by what is known as common green window glass. Let me show to what extent we have taxed that class of people in 1888:

IMPORTS OF COMMON WINDOW GLASS IN 1888.

	Value.	Duty Collected, Ad valorem.	Per Cent.
Sizes not exceeding 10 x 15	$288,927	$190,815	66
Sizes 16 x 24	265,919	305,357	114.83
Sizes 24 x 30	346,486	440,585	127.15
All above that	477,132	626,740	131.35
Total		$1,563,497	

We have squeezed out of the neediest, most hard-working of our population $1,563,000 taxes on their "daylight" or window tax, which has gone into the Treasury; but we have squeezed at least $5,000,000 more and put it into the pockets of people who made similar glass. Our Pan-American guests may reflect on the above statistics and come to the conclusion that having flourishing window-glass industries may, after all, not be the highest blessing.

I beg to assure Mr. Carnegie that I am "not" a grumbler, as I don't want to run the risk of having the door of heaven shut in my face when he succeeds St. Peter in office.

The Natural-Gas Supply. — At the recent meeting in New York of the American Geological Society, Prof. Edward Orton, State Geologist of Ohio, and a professor in the State University, in his paper answered those who claim that the great natural gas fields of the country are practically inexhaustible, and that nature is manufacturing the gas by chemical combination in the subterranean cavities as rapidly as it is consumed by man at the surface. He claimed that the supply of natural gas in those States was not only limited, but was being exhausted very rapidly and would be drained in less than nine years. The gas, he said, is now being used as the basis of a varied line of manufactures, the annual products of which aggregate many millions of dollars, and it is driving, besides the iron and steel mills of Pittsburgh, potteries and brick works, over forty glass furnaces and a long list of factories in which cheap power is a desideratum. The gas is the product of ages, which has been accumulated in the porous limestone of Ohio and Indiana. It has been produced so slowly that when once exhausted it will take many thousands of years for it to again accumulate in sufficient quantities to be used, even if the elements necessary for its production were preserved, which he thought was not at all probable. The pressure which forces the gas out with such tremendous power that it sometimes reaches 1,000 pounds pressure per square inch, is not due to the pressure of the gas itself, but to the hydrostatic pressure brought to bear by the column of salt water that enters the porous stratum of rock containing the gas at the sea-level, and which by its weight tends to force the gas out. To the explanation and elucidation of this phenomenon, Professor Orton's paper was more especially devoted. The men who are engaged in the practical development of gas and oil fields, said he, made great account of rock-pressure. It is the first fact they inquire after in a new gas-field. They appreciate its importance, knowing that the distance of the markets they care to reach and the size of the pipes they can employ are entirely dependent upon this element. He defined the term "rock-pressure," and showed the decrease of its rate westward. He said four hundred thousand people in Northwestern Ohio and Central Indiana alone depended upon natural-gas for fuel and illumination.

Statue Giving a Double Image. — At the Italian exhibition in the Champ de Mars there was a statue that attracted much attention from the visitors. It represented Goethe's Marguerite standing before a mirror. This latter gave by reflection the image of Faust. The artifice was well concealed by the sculptor. In reality, it was not a double statue, but the figure of Faust was skilfully obtained by means of the folds of Marguerite's robe.

Marguerite holds her arms in front of her, and these same arms form those of Faust, who holds them crossed behind his back. Faust's face is carved in Marguerite's back hair, and the man's figure is obtained, as before stated, by means of the folds of the woman's robe. This curious object might inspire some of our sculptors with an analogous idea. We do not know the name of the author of the statue, but we can say that it was exhibited by Mr. Francesco Toso, a Venetian manufacturer of mirrors. The statue was of wood, and of nearly life-size. — *La Nature.*

Site for the Kaiser's Monument. — Three or four Berlin banks have secured the preëmption of all the buildings in Schlossfreiheit-strasse, with a view to pulling them down and fulfilling the Emperor's wish to have his grandfather's monument erected there. Only a few days ago three of the most eminent Berlin architects declared that the place was absolutely unsuited for that purpose. The banks are said to have agreed to pay 5,000,000 marks for the houses, and an equal amount as compensation, and intend to form a lottery of 40,000,000 marks, with prizes to the amount of 30,000,000. — *The London Standard.*

TRADE SURVEYS

The salient features of the business situation this week afford every encouragement to the promoters of new schemes and the pioneers in industry. Among the additional factors which will stimulate trade and business during 1890 are the following: The construction of fifty per cent more railway mileage than was built last year; a very great increase in lake tonnage; a large increase in inland water-way tonnage; a very great increase in rolling-stock; a greater increase in locomotive capacity than has been made during any one year in our history; greater activity in house-building, and greater activity in the building of shops and factories. Several other interesting features also deserve mention, among them the very strong probability of the establishment of a larger number of banks during 1890 than were established during 1889 or any previous year; the more rapid expansion of the building and loan association system, particularly in the newer States; the increase in the output of the gold and silver mines of the West and Southwest; the opening-up of valuable coal-beds in many localities, which will tend to the establishment of little industries; a great increase in the area of land devoted to agriculture. Speaking generally, the agricultural interests will be stimulated. Speaking prophetically, it is very probable that prices will continue to advance, but by infinitesimal degrees. Speaking conservatively and in the light of recent experience, it is safe to assume and assert that production will be evenly gauged to consumptive requirements. Those who have kept a close eye upon the operations of manufacturers in all the leading channels recognize one very gratifying feature, and that is, that they are protecting themselves against unwarranted and unexpected advances in the cost of their raw material by making purchases for future requirements, ranging from three to six months. Users of cotton and wool are largely doing this; so are users of iron ore and iron and steel, as well as users of lumber, stone, cement and building material generally. This general policy of providing for legitimate future requirements is one of those instincts which safely guide the commercial world out of danger into safety. One fruitful source of panics in former periods of activity was the failure of consuming interests to supply themselves with raw material to complete their contracts. The business world has learned wisdom from its experience, and is now quietly turning a corner and wheeling into line safely early in 1890. The tanning interests of the United States have pursued this course in their limited field. The boot and shoe manufacturers, if they have not bought largely of raw material, have, at least, taken such steps as will guarantee them against a sudden advance. The clothing manufacturers have wisely purchased for their future wants; in fact, in almost every avenue of activity this policy has been pursued. The users of Lake ore have already bought five and one-half millions of the seven or eight million tons of ore they will want this year. The users of steel blooms and billets have bought so far ahead that manufacturers are now declining to make further contracts, excepting for very strong reasons. The Southern pig-iron makers are debating with themselves whether they will accept orders for pig-iron to be delivered next summer or wait a few months. Scores of illustrations of this sort could be enumerated. In many quarters this policy is believed to be an unwise one. Experience has shown it to be a safe one.

The iron industry, as a whole, is on a very permanent foundation. Manufacturers are hurrying to complete new works; lumber manufacturers, especially throughout the South, are stimulated to the greatest exertion by two new causes: First, a strong demand throughout the North for the superior lumber-mill products of the South; and second, a wonderful expansion of local demand in the South arising from the new industries there. The makers of nearly all kinds of machinery are busy with new work, fully one-half of which is for delivery in the new Southern or Western States. The manufacturers of steam-pumps, the manufacturers of appliances for new fuel-gas processes, the builders of heavy machinery for steam and electrical purposes, the manufacturers of hoisting-machinery and of machinery for mining purposes, as well as of machinery for general shop-use, have been booking more business since the 1st of October than their present shop-capacity will allow them to execute. Consequently, a general system of enlargement is in progress. Contracts have been lately given out for the construction of machinery to make machines of larger than usual dimensions. Our industries are being reorganized, and instead of engines of five, ten or fifty horse-power, engines of fifty to five hundred horse-power are now common. Agricultural operations are conducted by the aid of machinery upon a larger scale, and within the past six months a score or more of establishments for the manufacture of agricultural implements have been equipped with machinery, and facilities in the Western States, that indicate more clearly than anything else can do the magnitude and scope of our agricultural interests. Last year the rolling stock of the railroads was increased by some 54,000 freight cars, but it is probable that the additional orders this year will reach 100,000. The managers of several of the Western railroad systems have decided to erect repair-shops along their various systems, by which repair work and new work can be more expeditiously and economically done. The springing up of so many little industries along these new lines is creating local markets for farm-products. Last year the opening of coal mines, to the number of about sixty, promises a sufficient supply of coal to these new communities at a low cost. These encouragements are stimulating the outflow of population from the older States, and it is this outflow, coupled with the better conditions for living in the West through the development of industries, that is equalizing in such a healthy and natural way the great manufacturing and agricultural forces. By this growth of little industries, mechanical, mining and railroad, the decline in the value of farm-products is checked, or possibly altogether prevented; or, at least, the demand arising from this cause enables the farmer to obtain the very best possible price for what he has to sell. It is not out of place, at the opening of the year, to briefly direct attention to these forces acting beneath the surface. The manufacturer and merchant have nothing to fear from hidden destructive agencies. During the past two or three years several threatening commercial evils have arisen only to disappear by a self-correcting agency which seems to develop itself at the right time. The merchants and manufacturers of the New England and Middle States will find, this year, a much more valuable market west of the Mississippi than last year. The increasing demand for all kinds of raw material there during the past few months is a sure indication of the growth of a great market for the shop-products.

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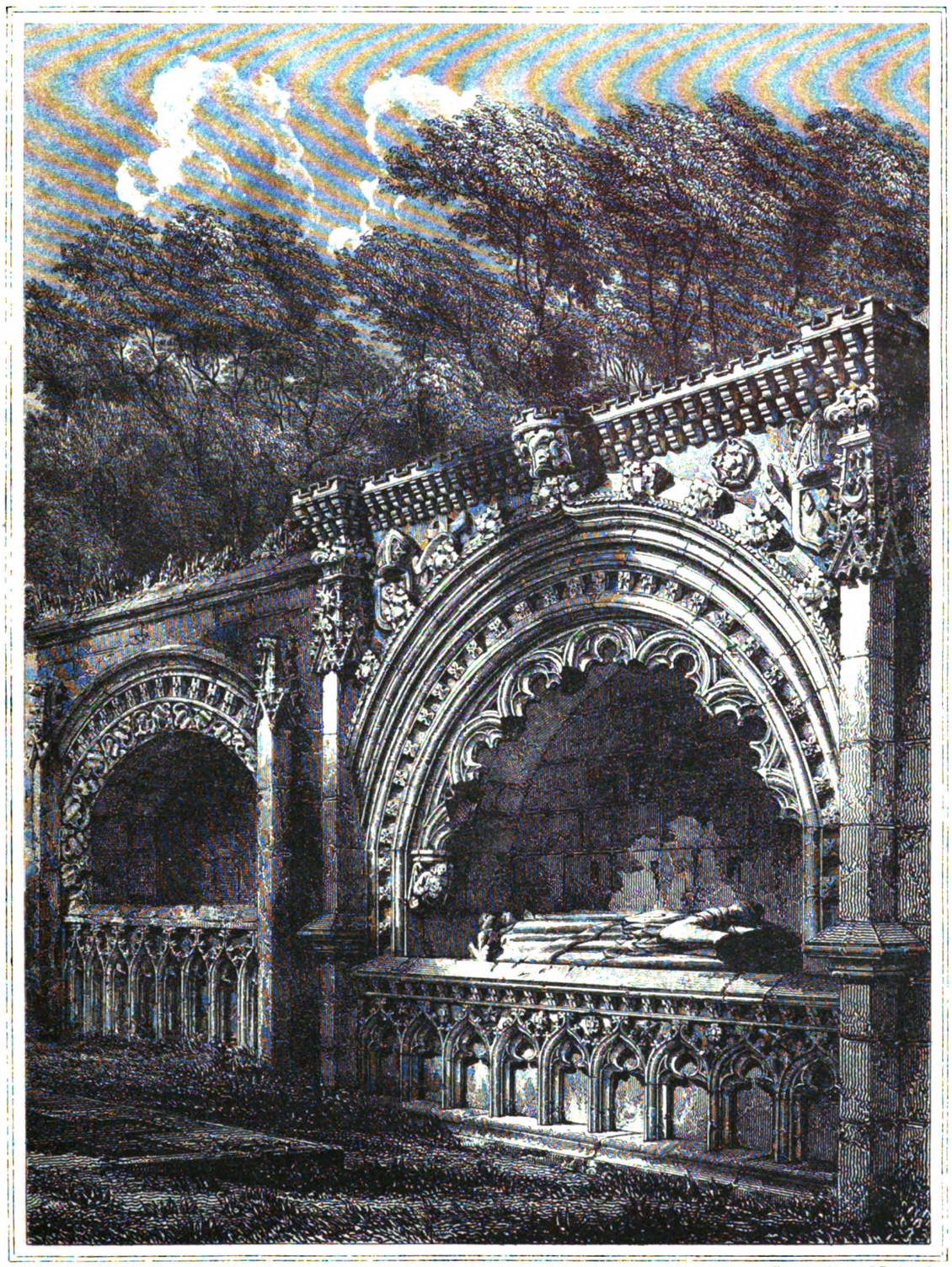

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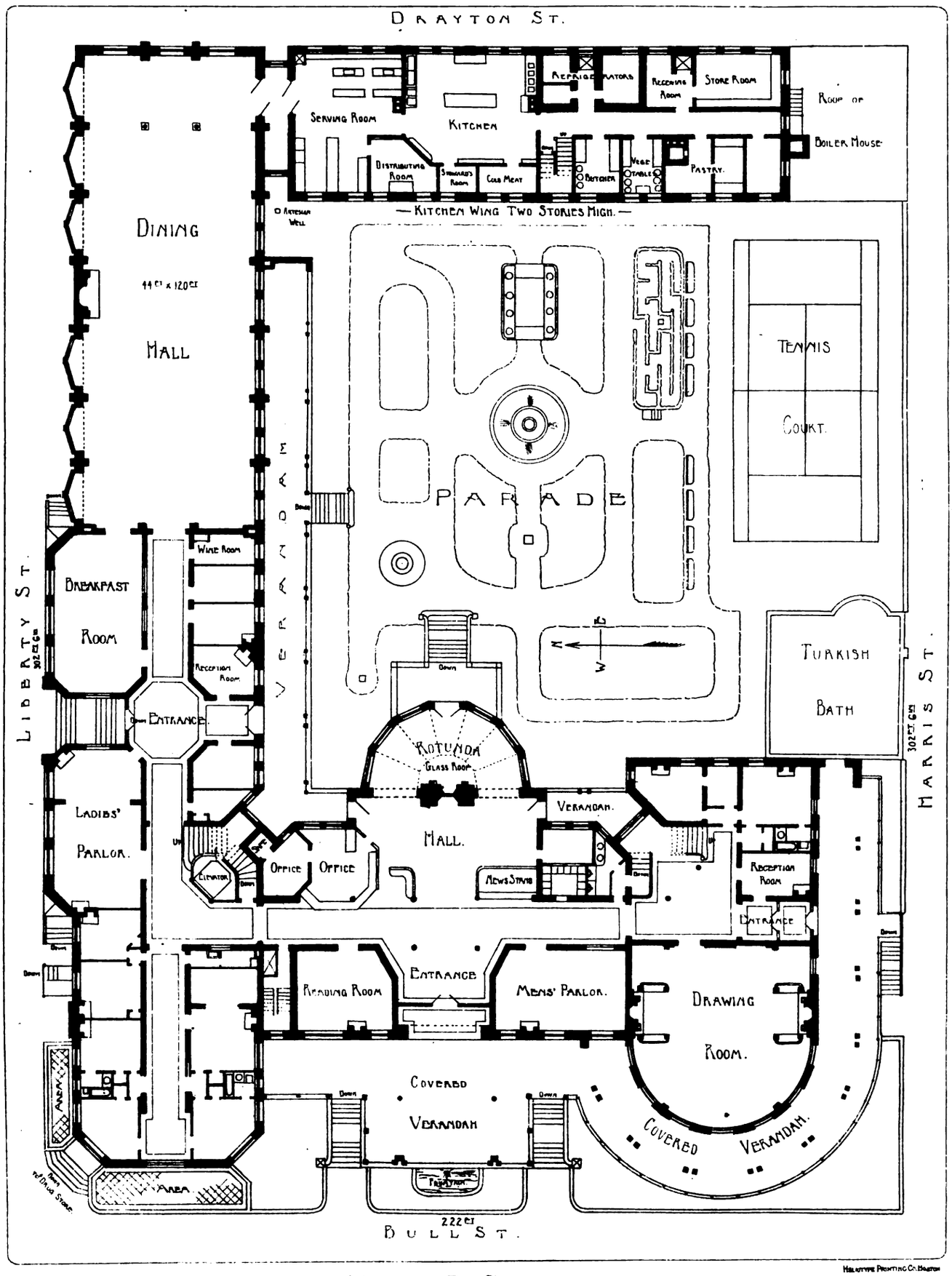

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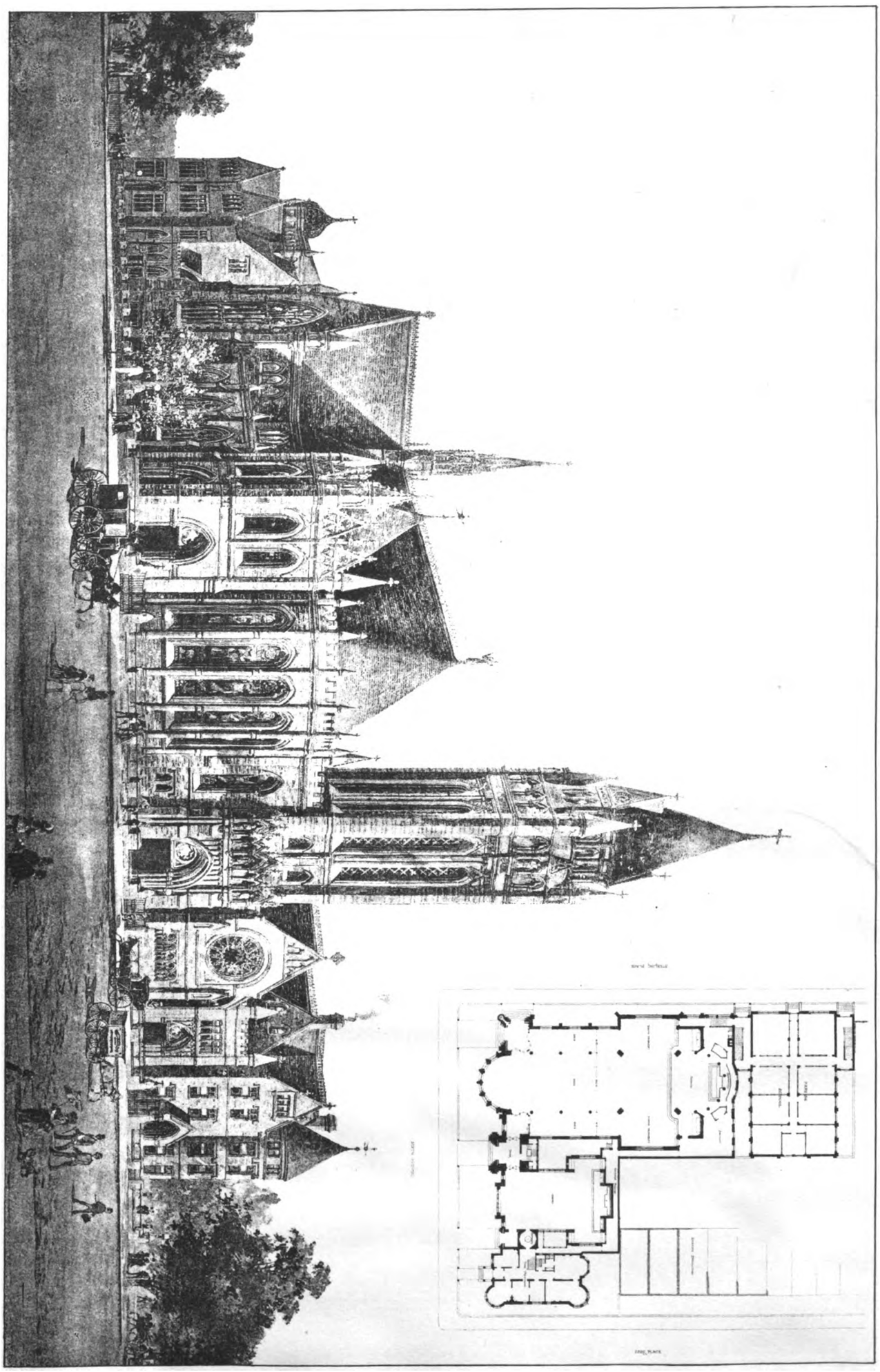

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EVERY one will be sorry to hear of the death of John McArthur, Jr., of Philadelphia, the distinguished architect of the Public Buildings of that city and of many other important works, who expired last week, after a long illness. Mr. McArthur was born in Scotland in 1823, but was brought to Philadelphia when only ten years of age. He went to school until old enough to learn a trade, and was then apprenticed to a carpenter. He served the full term of his indenture, but occupied his evenings in studying drawing and architecture, both by himself and at a night-school. In 1848 he competed for the House of Refuge, and his design was not only placed first, but he was entrusted with its execution. In 1849 and 1850 he did his last work as a mechanic, serving first as foreman for his uncle, the contractor for the erection of the Pennsylvania Hospital, and afterwards as superintendent of construction, on the part of the Trustees, during the completion of the east wing of the same building. After this he devoted himself entirely to architecture, and soon gained a large practice. Among other works in Philadelphia, he designed the Continental Hotel and the Girard House; the *Public Ledger* building, and a city as well as a country mansion for Mr. George W. Childs; the First National Bank, the Assembly Building and the Broad Street Presbyterian Church; and, outside of the city, he built several hospitals, churches and other important buildings. About twenty years ago, he was selected as architect of the vast and costly Philadelphia Public Building, and had, at the time of his death, carried this great work nearly to completion. Personally, Mr. McArthur was a man who at once inspired confidence, and his straightforwardness and energy won him innumerable friends, who, in the good old Philadelphia way, continued faithful to him through life. Among architects, his virtue and ability, together with his zeal in the defence of professional rights, made him greatly regarded, and the older people in Philadelphia, among whom "John McArthur" was a sort of oracle in regard to building matters, as well as his professional brethren, old and young, will long miss his friendly wisdom.

AS might have been expected the many employés whose service is required in the preparation of this journal have not escaped the disorganizing attack of the prevailing epidemic, and though we have worked double tides and done all that could be done during the past three weeks to keep things straight, every mail brings us proof that in some particular our efforts have been unavailing. If our subscribers and correspondents will have a little more patience with us than usual, they will find that questions are answered and errors rectified without unnecessary delay or a repetition of complaint on their part.

AN address was recently delivered before the Master Plumbers' Association, of New York, by Mr. Mackay, on hot-water heating, which contained a good many technical points of interest. Mr. Mackay is an earnest partisan of hot-water heating, but also a man of great practical experience. One of his observations, which architects should bear in mind, is that a cheap hot-water heater is an unsatisfactory investment. If the heater is of wrought-iron, as, for instance, in the case of the pipe-boilers frequently used, he finds that it will rust out, while he has known a good and heavy cast-iron heater to work as well twenty years after it was put in as when it was new. As to the comparative cost of steam and hot-water systems, his experience is that a good hot-water apparatus, complete with radiators, costs about ten per cent more, for the same efficiency, than what is known as a two-pipe steam apparatus, where the steam enters the radiators at one end, and the condensed water runs out of them at the other, with a valve on each pipe; and about thirty per cent more than a "one-pipe" steam apparatus, such as is sometimes put into houses, where the radiators have only one valve, and the condensed water runs back through the same pipe that brings the steam in. It is, however, hardly necessary to say to architects that the hot-water heating is far more agreeable, from the ease with which it can be regulated to any temperature, from thirty-two to two hundred degrees, than that by steam, where the practicable range of temperature in the radiators is only a very few degrees, from two hundred and twelve to about two hundred and thirty in most cases. Mr. Mackay thought that steam gave a "dry heat," and hot-water a moist one, which, of course, is a fallacy, but for some reason, possibly through the force of imagination, he finds that a steam-heated room at seventy degrees is "more oppressive" than a water-heated one at eighty. As to the comparative extent of radiating surface required for steam and hot-water, he mentioned that hot-water radiators should seldom be above one hundred and ninety degrees, while steam radiators, with steam at five-pounds pressure, will be at two hundred and twenty-eight degrees, so that in calculating heating-surface at least one-fifth more should be allowed for hot-water than for steam, and, we may add, it is prudent in practice to allow more than this, especially in the lower stories of a house, where the radiators are seldom at the maximum temperature. In regard to the care of the apparatus, he gives a much-needed warning against the very common practice of draining the water out of all the pipes and radiators as soon as the fires are allowed to go out in the spring, and leaving them empty until cold weather in the fall. This is an infallible method of rusting out and destroying the whole system. If it is desirable to empty the pipes and boiler, as is sometimes the case, where a building is to be left to itself in cold weather, a quantity of kerosene, one to ten or twelve gallons, should be first poured into the expansion tank at the top of the system, on top of the water. Then the cock at the bottom of the boiler may be opened and the water all drawn out. The oil will follow the water through the pipes, and give them a coating which will to some extent prevent rusting. Except in this case, however, the pipes should remain full of water winter and summer, and so long as they are full of water which has once been heated nearly or quite to the boiling point, they will not rust on the inside. Just before starting the fire in the fall, it is desirable to draw off the sediment which may have collected, and this may be done by opening the lowest cock on the boiler. If desired, all the water may be drawn off, and the system immediately filled through the expansion-tank at the top, with fresh water, but in a small and simple apparatus the water will often run clear after a few gallons have been drawn below, and in that case it is better to stop then, and merely replace the loss with fresh water.

THE competition for the Sheffield Municipal Buildings affords a good illustration of the way in which competitions for public buildings must now be arranged, if it is desired to interest many architects of the better class in them. In the first place, a well-known architect was appointed assessor to examine the designs submitted, and report upon them. This

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is an indispensable preliminary to any public competition in England, as nearly all the architects in Great Britain have agreed in writing to have nothing to do with any public competition in which the designs are not to be submitted to an architect known to the profession, for his judgment upon them. Secondly, the drawings asked for were few in number, and at a small scale — one-sixteenth of an inch to a foot; so that architects could compete with credit to themselves, without incurring a ruinous expense in making huge plans, which would be no better, for enabling the professional assessor to make up his mind, than the small ones, and would really serve no purpose except to impose upon uninstructed spectators. The consequence of thus inviting architects to compete with their talent and skill, before a judge capable of appreciating both, instead of expecting them to vie with each other in turning out gorgeously-rendered plans, to catch the eye of unskilled persons, was that one hundred and eighty designs were received, among which the Corporation of Sheffield ought to be able to find a satisfactory one. The *British Architect*, in commenting upon the affair, congratulates the profession and the public that so much progress has been made in the methods of conducting competitions, and says that in England it is "practically no longer possible for a competition to be won by money instead of brains." We wish something of the sort could be said of this country, but we are only slowly emerging from a condition similar to that which existed in England years ago, when, as the *British Architect* says, it has known fifteen hundred dollars spent on the competition-drawings for a building to cost only thirty thousand dollars. In this case the fifteen-hundred dollar design won the competition, "solely," as it says, "by the elaborate and sumptuous character of the drawings." How an architect, who spent the whole of his five per cent fees on the sketches which secured him the commission, expected to get paid for his working-drawings, specifications, details and superintendence, we will not try to guess, but even in less extreme cases, altogether too much money is spent among us in showy competition pictures. People outside the profession, who understand the childish way in which our architects often manage such matters, often amuse themselves, particularly in private competitions, by exciting the sensitive imaginations of the competitors, going about from one to another, and dropping hints of the "magnificent plans" that Mr. So-and-so is getting up, and so on. They think that this is legitimate sport, as it nerves the competitors to outdo themselves in the production of costly drawings, but it is death to the architects, and the sooner the profession can come to an understanding about the line where fair competition of designs ends, and dishonest claptrap, in the shape of showy drawings and frames, begins, the better off architects will be.

THE present mild winter, the third successive season of the kind, has, it is said, alarmed the ice companies, who fear that their crop of ice, always a precarious as well as a valuable one, will fail. Very few people realize the importance of the ice harvest in this country, or the value of a good ice-pond, advantageously situated for getting the ice to market. In ordinary seasons, the ice on the ponds in New England often reaches twenty inches in thickness, and two or three crops are generally taken off during the winter. At twenty inches thick, the ice formed over a square foot of water surface will weigh not far from ninety pounds, giving a production of nearly two thousand tons to the acre. The gathering and storing of the crop is not an expensive operation, but, supposing it to cost a dollar a ton, and the ice to be sold at two dollars a ton, the net value of the harvest, supposing only one crop to be secured, would be a thousand dollars an acre, while, under the usual conditions, where two or three crops are obtained, the net return will be about two thousand dollars an acre. Compared with wheat, which must be sown and cultivated, as well as reaped, to return fifteen or twenty dollars to the acre, ice certainly occupies an enviable position as an agricultural product, and it is not strange that the city of Cambridge, in Massachusetts, once had to take legal measures against an ice company, which gathered so much ice off the lake on which it depended for its water-supply as to reduce the supply below the requirements of the city. Unfortunately, the large and clear ponds are mostly monopolized by great companies, and small, irresponsible dealers gather ice where they can, often from pools of surface-water, draining from the most objectionable sources. Many serious outbreaks of typhoid fever have been traced to the use of such ice, and, unless a rigorous inspection of natural ice is instituted, they are likely to increase in number and seriousness, as the villages in the neighborhood of the large cities fill with settlers. In Europe, the condition of the ponds is generally such that good natural ice cannot be taken from them, even if the climate of the Continent were cold enough to produce the thick, transparent sheets with which we are familiar, but a great deal of muddy ice, in small pieces, is gathered and sold. Some ice is brought, particularly to England, from the Norway lakes, and Paris has been supplied with the peculiar crystalline glacier ice from Switzerland, but natural ice is now being rapidly superseded by the artificial ice, made with the well-known ammonia machines. This ice is said sometimes to taste of ammonia, so that it cannot always be put directly into water, as ice is generally used here, but the best machines profess to be entirely free from leakage, and, as distilled water is used, the ice is very solid and clear. The business of manufacturing it is now carried on at a vast scale. A single factory in Paris, using an improved apparatus recently invented, turns out a hundred tons of ice a day, and ice-making establishments exist in all the large towns from the North Sea to the Straits of Gibraltar.

THE Belgian Government has the amiable habit of holding a Prize of Rome competition every year, at which some artist, painter or sculptor or architect receives appointment as official student, with a liberal income, for four years. This year it is the turn of the architects to compete for the prize, and Belgians, either native or naturalized, are invited to take part in the contest. No one is allowed to enter who will be thirty years old or more before the opening of the competition, and all candidates must present a certificate of having passed satisfactorily the general scientific and literary examination held at stated intervals under Government authority. Candidates prepared in this way are admitted to a preparatory examination, which is to be held at the Royal Academy of Arts, in Antwerp, May 12. The six candidates who pass with most credit the preparatory examination are admitted to the final examination, which takes place immediately afterwards, and the best of the six receives the appointment, with a pension of eight hundred dollars a year for four years. The second in rank receives a gold medal, and the third an honorable mention.

BELGIUM is, of all others, the country of prizes and honors. A Government Commission, using the income from a fund bequeathed for the purpose, distributes every year valuable medals for the best work in artistic history and executed specimens. This year, the essays in the history of art are to be in the form of answers to four questions. The first of these is: What was the instrumental composition of the bands of musicians employed by town officials, princes and and chiefs of guilds, particularly in the Belgian provinces, from the fifteenth century to the end of the Spanish domination? What sort of music did they play, and why have the compositions written for them almost entirely disappeared? The second question calls for a history of ceramic arts in Belgium from the fifteenth to the end of the eighteenth century; and the third asks what influence have Belgian sculptors had upon French art since the fourteenth century. The fourth question is architectural, and requires the analysis, with sketches, of Flemish architecture of the sixteenth century. Obviously, to answer any of these questions properly, will require a good deal of study and original research, but the prizes offered are worth taking some trouble for; a gold medal, of the value of two hundred dollars, being given for the best answer to each of the first three questions, while the author of the best reply to the third question receives a gold medal of the value of one hundred and sixty dollars. In the competitions for executed work, one hundred and twenty dollars in money is offered for the best design for a diploma, to be presented to the prize-winners; and the same amount for the best model, in wax or plaster, for a medal to commemorate the assumption by the King of Belgium of the sovereignty of the Congo State.

THE Fourth Annual Convention of the National Association of Master Builders will be held in St. Paul, Minn., on the 27th, 28th and 29th of this month. The previous Conventions of the Association have done much to cultivate a good understanding among builders, and to promote the solution of the long-standing problems which individual builders have hitherto been unable to deal with, and the next one will probably be no exception to the rule.

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CIVIL AND DOMESTIC ARCHITECTURE.[1] — II.

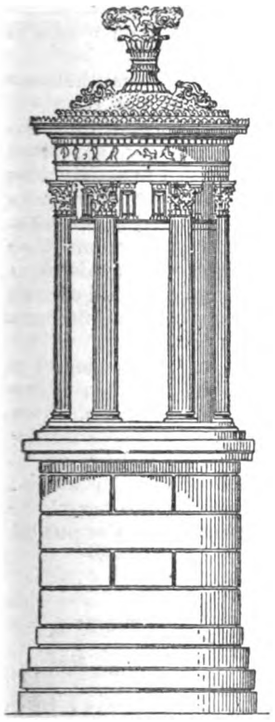

Fig. 1. Elevation of the Monument of Lysicratus.

WE must enter Greece to discover the germs of democratic government. There, after a long period of groping, were laid the foundations of that popular rule which, with the aid of the laws of Lycurgus, of Draco and of Solon, was destined to develop the national character to a high degree. The Greek cities, assured of peace for a certain period after their defeat of the Persians, devoted themselves to the cultivation of the sciences, letters, art and philosophy. In time, by the side of their temples they built agoras adorned with rich colonnades, within which justice was dispensed and private and state affairs were discussed; they erected stone theatres where the people saw depicted the chief events of their history; they founded gymnasia where the youth could exercise their bodies, and where they could train their minds in listening to the teachings of philosophers.

In the golden days of Hellas, art was essentially a thing of politics, it played no part in private life. It was fostered to enhance the honor and glory of cities and not to minister to the *amour propre* of any individual. For this reason, though the public edifices were built and embellished with much magnificence, private dwellings were for a long time of the most modest order. It required the advent of Macedonian rule, which loosened the union of the various Grecian cities; it required a great extension of the money coinage, which led to an unequal distribution of the public wealth, for art to become subservient to riches, and, abandoning the construction of temples, to turn to the flattery of rulers by dedicating honorary monuments to them. Then men of affluence had their palaces, and the people, grown indolent and greedy for amusements, demanded new theatres and porticos where they could parade their idleness.

The earliest inhabitants of Greece, the Pelasgians, built on elevated sites whence they could more readily repel the attacks of their neighbors. They fortified their town with Cyclopean walls, which were constructed without towers and were probably embattled. Running around the fortifications, and formed in the thickness of the walls, were galleries, remains of which still exist in the ruins of Tiryns and Delos. The houses were set with no regard to order. A square was laid out in the centre of the town as an assembling-place for the citizens; around it were stone seats appropriated to the chief men. The Pelasgians also had wells and cisterns. A temple dedicated to the guardian deity of the city always dominated their fortifications. They erected structures used for storing grain, like the one discovered at Missolonghi. They built others, called treasuries, to receive the public money and valuables, as for example, those at Orchomenus and Mycenæ. These served also as tombs and were constructed of horizontal courses laid as corbels and forming a vault.

As for the palaces of the primitive heroes of Greece, we must turn to the tales of Homer for a description of them. Though situated within the city walls they were, nevertheless, enclosed by fortifications. The stables, chariot-houses and storehouses all opened on an outer court; around the principal court, which was adorned with porticos, came first the great hall where strangers and friends of the family were received, then the men's apartments, the baths, and the rooms where the women gathered to work; the women's private apartments were in an upper story.

There was a marked resemblance between the ancient Greek palaces and those of the Asiatic and Egyptian princes. In both there were spacious halls reserved for public uses, and around these were rooms for the domestic life and for the service. In both there were distinct apartments for the men and the women, with but few openings on the street. The same peculiarities are to be noticed to-day in the modern seraglios of Oriental countries. At a later period, in Greece itself, the separation of the men's and women's quarters was more and more sharply defined, until they finally formed different buildings.

In time the dwellings of the wealthy came to comprise two divisions, one for the men, called the *andronitis*, the other, occupied by the women, and known as the *gynæceum;* both were disposed on the same floor around a colonnaded court. In general, the houses were only one story high, and they were always roofed with a flat roof, surrounded by a balustrade. These roofs were formed of layers of broken pottery mixed with lime, with a course of tiles on the top. The rooms were also paved with much care.

At the period when these costly structures were erected, Greek society had already been long organized. The cities had developed. They did not now, as in the days of the Pelasgians, occupy the hill-tops; on the contrary, they were scattered through the plains and along the shores of the sea, and at the foot of the mountains; at the highest point they were fortified with a citadel, the acropolis. They were traversed by well-paved roads, and in the sections bounded by these broad streets, the houses were separated by narrower ways.

According to Vitruvius, in maritime cities the agora was of necessity close to the port, while it was always situated in the centre of inland towns. In early times this public square was crossed by several streets, but it was afterward enclosed by porticos with flat roofs. Temples and commemorative monuments were erected in it. The magistrates dispensed justice there, and there the people assembled to discuss the weighty affairs of State. It was of the highest importance that the citizens should have well-built, well-knit frames, and to secure this the Greeks gave great attention to the physical training of their youth: they honored the memory of their heroes with games, and some place was needed for the practice of these sports, which included running, shooting with the bow, throwing the javelin and wrestling. To supply the want gymnasia were opened, with a stadium for running, spaces for wrestling, leaping and other games, and hot and cold baths; and along with this equipment for physical development provision was made for the cultivation of the mind, by the addition of halls where the philosophers of the time gave public lessons. The whole was surrounded by porches, or porticos where these lessons could be continued in the shape of simple talks.

Stadia also existed independently of the gymnasia, as well as hippodromes for chariot races. But there were poetical and musical contests connected with these games, which were instituted to celebrate the burial anniversaries of certain Greek heroes. Among the ancient Greeks it was the custom, too, in the Dionysia to have hymns sung in honor of Bacchus. This was the origin of the theatre. The Athenians were at first satisfied with temporary theatrical structures, but after one of these had fallen, and at the instigation of the poet Æschylus, they determined to build a stone edifice. They chose for its site the foot of the Acropolis, and a part of the seats reserved for the spectators were cut into the flank of the hill, which was a hemicycle in shape and rose like an amphitheatre. The disposition of this theatre at Athens seems to have supplied the model for other Greek structures of the kind, and it was imitated later on by the Etruscans and Romans.

The Greek theatre comprised three essential parts: the stage, the orchestra and the seats for the spectators. The orchestra, reserved for the choruses, and semicircular in form, occupied the centre of the hemicycle and separated the seats from the scene, or rather from the proscenium, or stage proper. The stage, which was broader than the orchestra, was rectangular in shape, and the wall back of it (the scene) was pierced by three doors.

Another kind of theatre, designed more especially for concerts, was known under the name of odeum. The odeum had a roof supported by rows of columns.

Theatrical performances possessed, in Greece, the character of a religious and national institution. A choragus directed the formation of the choruses, and when his company carried off a victory he received a bronze tripod as a reward. These tripods were afterwards placed on a column bearing an inscription, or at the top of an *ædicula* in the form of a temple. A great number of these *ædiculæ* were to be seen in Athens. But the most celebrated is the choragic monument raised by Lysicrates, 335 B. C. It consists of a quadrangular basement, or podium, surmounted by a cyclostyle of six engaged columns of Corinthian order, and covered by a richly ornamented tholus or dome

[1] From the French of G. Guicestre, in "*Encyclopédie de l'Architecture et de la Construction.*" Continued from No. 733, page 21.

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terminating in a foliated and heliced acroterium (Figures 1, 2 and 3).

There is still in existence at Athens another species of monument, one of public utility; we mean the famous Tower of the Winds, which ministered to different needs of Greek life. It stood not far from the agora, and served at the same time as a town-clock and weather-vane. Its plan is octagonal, and its vertical walls were adorned with sculptures or accessories in harmony with the purposes for which it was designed. A triton, moving on a pivot and indicating the direction of the wind, was fastened to the apex of the roof. In the interior there was a water-clock (Figures 4, 5, 6).

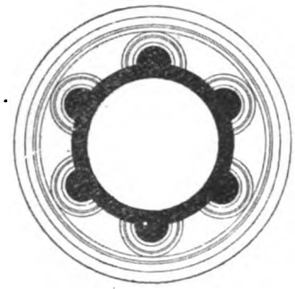

Fig. 2. Plan of the Monument of Lysicratus.

From this simple résumé we can see to how many new purposes civil architecture was applied by the Greeks. The positive and eminently administrative character of the Romans was destined to give additional impulse to it.

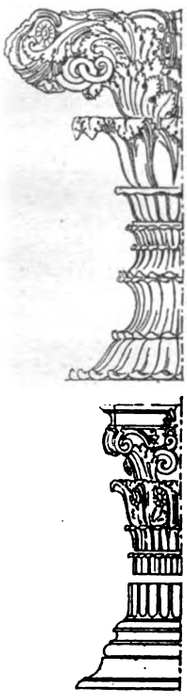

Fig. 3. Details of the Monument of Lysicratus.

Fig. 4. Elevation and Plan of the Tower of the Winds.

We will pass hurriedly over Etruria, on account of the lack of wholly authentic records of its monuments. The oldest structures found there are works of defence. Nevertheless, its sepulchral architecture is better known. For the Etruscans, as well as for all other peoples of antiquity, death was not the end of man; there remained something material of him, the *shade*, which retained his traits and his habits, and which demanded to be surrounded by all that had been dear to him on earth. The tomb became thus the image of the dwelling.

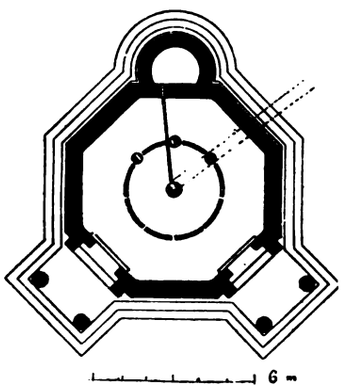

Fig. 5. Elevation and Plan of the Tower of the Winds.

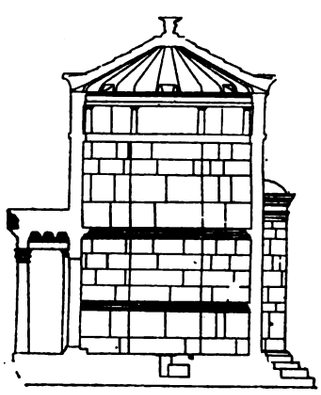

Fig. 6. Section of the Tower of the Winds.

This dwelling contained, at first, one rectangular room, with a roof sloping in four directions and open at the apex, to allow the smoke to escape. The wealthy Tuscans added other apartments to this primitive room. These all opened on a small half-covered court called the *atrium*.

The Etruscan house served as a model for the Roman houses until near the close of the Republic. But in the time of Augustus, when the Roman had become habituated to ease and comfort, when he had discovered richer and more spacious dwellings in Greece, his former habitation ceased to satisfy his needs. Still he did not give it up wholly; he lodged his servants and stored his provisions in it, and there he received his clients and attended to his business affairs; in fact, it became the public part of his house. He merely added to it, for his own comfort and use, suites of apartments opening on a second court; this court, surrounded by a colonnade, was adorned with flowers and with a fountain of running-water in the centre.

The Roman house, like the Greek, had but few openings on the public street. Certain dwellings, as in Pompeii, were limited to the ground-floor; others, like those in Rome, were several stories high, and Augustus promulgated a decree fixing the maximum height at seventy feet. Nothing is very accurately known regarding the arrangement of Roman cities. There seem to have been no definite rules concerning their form, the direction of the streets, or the situation of the public edifices. They were walled and the gates had generally a single arched entrance. There were gates, however, as that at Herculaneum, with one large and two smaller arched openings.

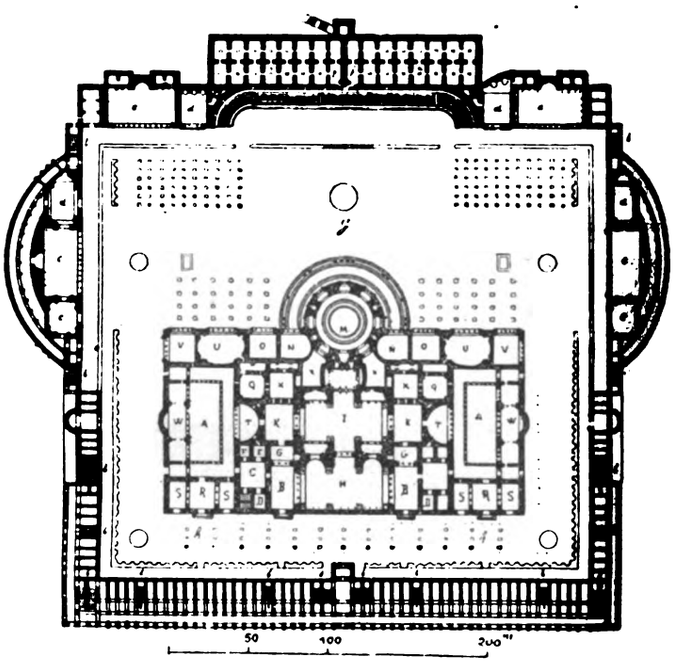

Fig. 7. Plan of the Baths of Caracalla. A Open Peristyles. — B Entrance Peristyle. — C Apodyteria. — D Capsarii. — E Elæothesia. — F Conisteria. — G Rooms for Social Gatherings. — H, O, V Frigidarium. — I Central Hall. — K Spectators. — L, N, P Tepidarium. — M Calidarium. — Q Sudatorium. — R Vestibule. — S, T Exedræ. — U Exercise Rooms. — X Courts. — W Ephebæ. — *b* Stairways. — *c* Disputation Halls. — *d* Academic Rooms. — *e* Palæstræ. — *f* Reservoirs. — *g* Xyste. — *h* Garden.

The roads were an especial object of attention among the Romans. Who does not know how much importance they attached to all works of public utility! They were never baffled by any obstacle, and it is noticeable that the interests that were most neglected in Greece, the aqueducts, sewers and highways, were the ones which were most sedulously looked after in Rome, by the ediles.

The great roads, near the cities, were lined with tombs, temples and villas; they were adorned with triumphal arches; there were inns for the comfort of travellers, and men were stationed along the ways whose business it was to examine passports. Every thousand paces, columns (from five to eight feet high) were erected to indicate the distances, and there was always an inscription on each one giving the name of the director and the repairer of the road.

Wherever the Romans pushed their conquests, in France, in Spain, in Greece, in Asia, in Africa, at the same time that they built roads they attended to the water-supply of the country. They tapped the most abundant springs, wherever they were situated, and conducted the water in artificial channels to the

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city where it was needed. These channels were made of stone or brick, and vaulted or covered with a paving. When mountains were to be crossed, the conduit was run through a subterranean gallery; it was carried over valleys in solid walls of masonry, or on series of arcades, the piers of which were more or less raised according to the unevenness of the ground. In cases of necessity, two or three ranges of arches were constructed, one above the other.

The aqueduct emptied into a reservoir or *castellum*, from which the water was distributed through the town by means of lead or terra-cotta, or even wooden pipes. It went to supply the public fountains, of which, in Rome itself, there were great numbers; it furnished the thermæ, and a part of it was reserved for private uses.

Under the Empire, in the reign of Nerva, the aqueducts of Rome numbered nine. Among those which the Romans constructed in the conquered provinces, the grandest and the boldest is the celebrated Pont du Gard, built for the city of Nîmes. It comprises two rows of large and one row of small arches, all semicircular. There is also another very beautiful aqueduct at Segovia, in Spain. Water was likewise stored in cisterns; at Pompeii, every house had its small cistern fed by the rains, and most Roman cities were well supplied with these reservoirs.

Grottos in which there was running water were often decorated with porches and statues. Such structures were called *nymphæa*, because the Greeks, from whom the custom of building them was borrowed, dedicated similar spots to the nymphs. They were much frequented and became, at last, resorts for pleasure and debauchery.

The sewerage of Roman towns was carried off in subterranean vaulted conduits, called *cloacæ*, which ran under all the streets and communicated with one principal channel. In Rome this principal channel, the Cloaca Maxima, emptied the filth of the city into the Tiber. This sewer, which offers the oldest example of a semicircular vault built of voussoirs, dates back to the time of Tarquin the Elder. The Romans may be said to have achieved perfection at the outset in all these works, and to have bequeathed them to posterity in an entirely finished state.

Their first bridges were of wood. Some were afterward rebuilt with stone, like the Pons Sublicius. Trajan constructed one across the Danube having stone piers and wooden arcades. The bridge of Alcantara, in Spain, still in existence, was wholly of stone, with six large arches. A triumphal arch rises in the centre of it. Another bridge was thrown over the Tiber by the Emperor Adrian, in front of his mausoleum. It is of stone, and presents three large arches made of *voussoirs* comprised between two small ones. The piers are so built as to oppose an angle to the current of the stream. The entrances slope down over the two small arches. There are remains of other bridges at Rome constructed on the same principle.

We have said that a portion of the water which was carried to such distances in the aqueducts was destined to supply the thermæ. Thermæ, or public baths, existed in great numbers in Rome from the days of the Republic. The use of the baths was a daily necessity to the plebeian as well as to the patrician. But Agrippa was the first to open them to the common people, and to introduce a public establishment for the especial accommodation of this class.

The construction of thermæ became a means of currying popular favor as soon as the Romans had converted what was at first one of their pleasures into a hygienic measure; and distinguished men, even emperors, as Nero, Vespasian, Antoninus, Caracalla, Titus, Diocletian and Constantine, erected magnificent ones, which still retain the names of their projectors.

The most complete thermæ were built on the model of the Greek gymnasia. There was an outer enclosure, comprising porticos, halls for the athletes and *exedræ*, where the philosophers gave their lessons. In the second enclosure were the baths, properly so-called; these had nearly always essentially the same arrangement: the tepid bath (*cella tepidaria*), the hot bath (*cella calidaria*), the cold bath (*cella frigidaria*), the vapor-bath (*laconicum*), the massage-room (*unctorium*), and around these were other rooms, proportioned in number to the importance of the establishment (waiting-rooms, dressing-rooms, restaurants, reading-rooms, libraries, promenades). The space between the two principal groups of structures was occupied by gardens, *stadia* and *palæstræ*, and sometimes, also, there were fountains of cold water.

[To be continued.]

THE ART OF THE VIKINGS.[1] — I.

⅓ real size.

Fig. 785.—Double-edged sword-hilt, inlaid with silver and bronze, with broken blade. In a tumulus with an axe, a spear-head cut and bent, three shield-bosses, two horses' bits, two stirrups, a hammer, the end of a chain, a piece of a two-edged sword, &c.—Norway.

IT is an interesting fact that by far the larger part of the remains of any people of prehistoric or historic times is artistic. This is so, very likely, because those objects which have some ornamentation were taken better care of than those either devoid of decoration or more roughly and therefore less lastingly made. A decorated article, whether it was personal apparel, a weapon, a piece of furniture or what not, was a source of pleasure to the owner, and an indication of his wealth and position. Therefore it was that in earlier times when men carried this world's goods into the next, or at least thought they did, they were buried with them. It is fortunate for modern research that this custom was well-nigh universal in certain periods of history, for it has been the means of preserving for us a multitude of articles that must otherwise have perished, and has given us an insight into manners and customs of which we have no other knowledge.

The materials of ancient Scandinavian art are not wholly dependent on the relics obtained from graves, but are composed of an abundance of finds that have been rescued from numerous sources, as often the most unexpected as not. Like Egyptian art, that of the Vikings has, apparently, no beginnings. Not that at one time it was not very crude, but the larger part of the specimens that have come down to us exhibit a taste and skill of technique of a very high order and of a very fair average degree of excellence. Such work as was inferior or belonged to a less advanced period has been swept away or lost in the mass of work left by the more civilized people. There are, indeed, relics of an earlier time, of the stone, bronze and iron ages, but these exhibit very similar characteristics to those of the later period, and the difference between them is more a matter of technique than an evolution of art-forms. The absence of any definite chronology and the consequent inability to refer any one work to a particular date is another element that hinders the tracing of any accurate development.

Within its own lines Viking art — using the expression as a convenient means of designating the art of the early Scandinavian — made rapid and successful progress, but whatever may have been the relation of these people to our own English ancestry their art has certainly not affected ours or that of central Europe. English art, in common with that of all western Europe, owes its origin to southern influences, being the outcome of Greek art, which, in its turn, either came directly from the Egyptian or was largely influenced by it. Doubtless there are here and there to be found various ancient English forms which have a Scandinavian cast, but they are not sufficient to indicate any marked influence. The forms of Scandinavian art are so very different from those of other people that it may be questioned if it was ever in any way related to southern art. Interesting as is the study, however, it is not necessary for a correct appreciation of the art of the Vikings to raise the question of its origin or its relation to allied forms: it is sufficient for the present purpose to accept it as it is, and study its results as best we may from existing remains.

The Vikings were a seafaring race, and their skill as architects was, therefore, better shown in their ships than in their houses. These last were, however, of pretentious design in many instances, and, if we may believe tradition, were not without the comforts which make life tolerable. The ancient writings, as is so generally the case, have little to tell us of the common folk, and our knowledge of Viking architecture is, therefore, limited to the palaces and dwellings of the kings and important men. These were sufficiently luxurious to indicate the wealth and power of the owner. Each chief lived in his own house with his family, retainers and servants. The house was a collection of dwellings or rooms built around a quadrangle, an open space in front and the whole surrounded by a fence through which access was had by means of a gate or gateways. Each part of the group of buildings had its own name. Some apartments were used as sleeping-rooms, and here the women spent most of their time, though there were also parts devoted exclusively to them where the men were not permitted to enter. At times a loft was built over the lower portion and was used as a bedroom. This had an external balcony and staircase on one side. They were not, however, always desirable places to sleep in, for it is related that when one Fjolner, "assisted King Frodi in Denmark, he was given a loft-room as a

[1] "*The Viking Age*" by Paul B. du Chaillu. New York: Charles Scribner's Sons. 1889. 2 Vols. 8vo. $7.50.

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sleeping-apartment; in an adjoining loft-room the flooring had been removed, in order to fill the large mead-vat standing in the *undir skemma* (lower floor). During the night Fjolner went out, and as he had to return along the *svalir* (balcony) to his room, he made a mistake as to the door, and fell into the mead-vat." The windows or light-holes were usually covered with the after-birth membrane enclosing the fœtus of the cow, which, when dried, became almost as transparent as glass. There were no chimneys, and the smoke covered the roofs — for there were also no ceilings — with soot.

The most important edifices erected in the country were the halls, which were built only by the kings, chiefs or jarls. They were used for feats, and were built east and west, with the longer walls running north and south. There were two doors, one for men and one for women, and the walls were usually decorated with carvings or with tapestry; sometimes they were almost entirely covered with the shields of the guests, hung close together. Benches were placed

Fig. 1091.—Carved doorway, Sauland's Church, Thelemarken. Height, 13 feet; width, 7¾ feet; height of door, 7½ feet; width of door, 2½ feet.

along the longer walls, and in the centre of each row was the seat of honor or "high-seat," as it was termed. The one on the north was reserved for the master, and that on the south for the most distinguished guest. Cross-benches were sometimes placed in the hall and were reserved for women.

The Vikings built temples, but while the Sagas frequently mention their gorgeous decorations, the absence of any remains or any definite description renders a detailed account of them impossible. Some of them seem to have been built in two parts, an inner sacred place where the image was kept, and an outer part for the public. What were called "high-seat pillars" were placed inside the principal door of the temple. They were carried by the different families when they emigrated to Iceland, and cast into the sea as they approached the land. The place where they came ashore was then selected as the site for the new homestead.

Carving in wood was the art *par excellence* of the Vikings. They excelled in this beautiful work and reached a degree of perfection that has seldom been obtained by any artists. Wood is the most readily carved of all substances, and the presence of large quantities of the finest timber unquestionably gave the impetus to the art. It is interesting to notice in certain early English churches, that those built in a woody district, exhibit more carved decoration, even in stone, than those of the same era built in places where timber is scarce, and where the necessary preliminary training in wood could not have been had. The Viking artists seem to have confined themselves chiefly to wood, as there are but few stone specimens to be found. It is fortunate for us that such was the case, for, while their designs do not in any way indicate the material, it is not probable that such a characteristic art would have been developed had they made use of more varied substances. The designs were chiefly carved in relief, and were intended to ornament surfaces rather than to stand alone. They were composed principally of exquisite twist-

Fig. 1123.

Fig. 1124.

Door-jambs, Hylliestad Church, Sætersdal; 7 feet high, 1¾ feet wide.

ings and intertwinings of lines, with conventional foliage and a few animal forms, also conventional. The human figure was sometimes introduced, and at times in quite complicated groups, but they never reached the same success in this work as they did in line-designs. Some relics of early times show bolder attempts at the human figure than can be found in the best work of the later period. A handle of a knife which may be referred to the bronze age, is in the form of a man, while another shows the bust only. A tombstone from the Kivik grave, one of the most interesting relics of the same time, shows no less than twelve small figures in outline, evidently representing a scene of some kind. But these examples appear to be exceptional, and such work is of rare occurrence.

The doorways of the Viking buildings were a unique and characteristic feature. The jambs were elaborately carved with ornament sometimes five feet or more in width, composed of an elaborate combination of curved lines. Human figures are occasionally introduced, chiefly in representing scenes from the old legends. In one doorway

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seven episodes from the Volsunga Saga were represented, including Regin forging a sword, Sigurd trying it, Sigurd piercing the snake Fafnir, Sigurd roasting the heart of Fafnir, Sigurd's horse Gran, Sigurd slaying Regin, Gumar in the snake-pit playing the harp with his toes. This doorway, which is from the Hyllested Church, Soetersdal, is an exception in the large number of scenes depicted, but the slaying of the serpent Fafnir was of frequent occurrence. The dragon was, in fact, the favorite animal form used by the Vikings, and is put to all sorts of artistic uses.

Almost everything of wood that the Vikings used was more or less carved. The door-jambs were a thoroughly characteristic instance, because nothing like them is to be found in the whole history of art. Other peoples did, indeed, design decorations for their doorways which were quite as beautiful in their way as the Viking ornament is in its, but nothing just like it was ever produced elsewhere. The doors were elaborately carved, though never to the extent of the jambs, and a few exist on which the ornamentation is in wrought-iron. Chairs and benches and tables were all beautifully decorated in the same manner. The designs, while chiefly conventional, included at times scenes from the Sagas. Viking furniture

Fig. 1115.

Fig. 1116.

Door-jambs of Hyllestad Church, Sœtersdal. Height, 7 feet; width, 1¾ feet. Representation of seven episodes from the Volsunga Saga — Regin forging a sword; Sigurd trying it; Sigurd piercing the snake Fafnir; Sigurd roasting the heart of Fafnir; Sigurd's horse *Grani;* Sigurd slaying Regin; and Gunnar in the snake-pit playing the harp with his toes.

does not appear to have been very plentiful, but they made good artistic use of what they had. As is to be expected of a seafaring race which took such ample care of the decorations of their dwellings, they exercised an equal skill in ornamenting their ships and boats. In fact, almost every part of their vessels was decorated either with carvings or with paint. The general appearance of a decorated vessel is graphically described by an ancient writer: "King Magnus the Good saw one day a ship sailing eastward off the land. It was ornamented all over with gold above the water, and fine dragon-heads were on it, but the sails were of two-fold *pell* [a species of velvet] most splendidly woven. This ship was painted with red, purple and gold, as well as the beaks of the dragon-heads; inside these were valiant men dressed in costly garments and *pell*." While

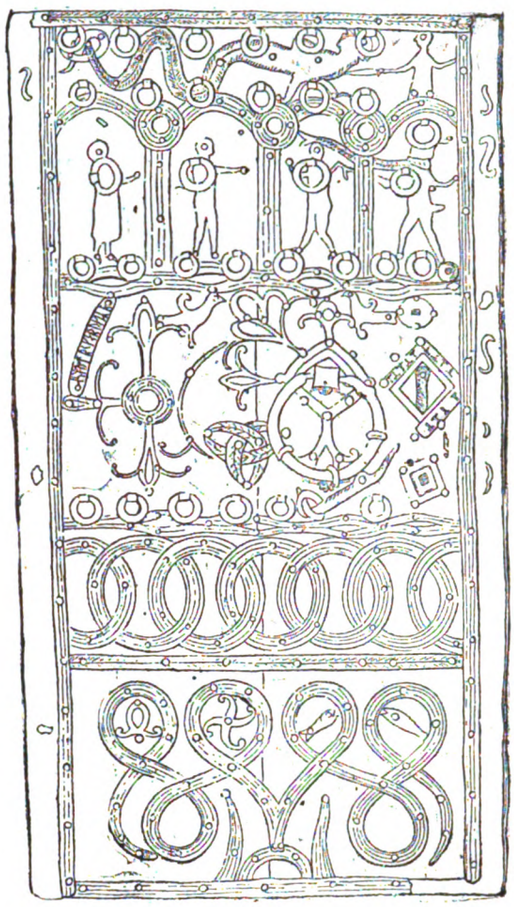

Fig. 1092.—The Church-door of Versås, Vestergötland. Representation of Sigurd slaying the serpent Fafnir: Runic inscription, *Asmutr Kärthi Dyrr* = Asmund made the door; and svastica.

the Vikings may be said to have excelled as carvers of wood, they were equally proficient in other branches of art. They were skilled

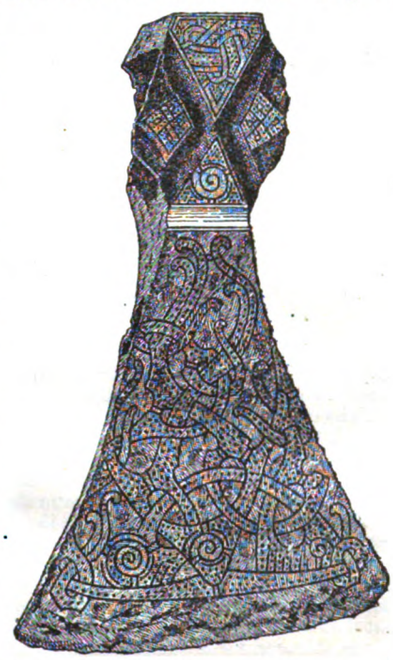

Fig. 864.—Axe inlaid with metal, of silver mixed with gold. Bjerringhöi mound at Mammen, near Viborg. ¼ real size.—

workers in metal, in bronze, in iron, in silver, in gold. Their weapons were chiefly of iron, though both wood and bronze were used. Bronze was frequently used for trimming wooden weapons or parts of weapons, as scabbards, and as mountings for quivers and similar purposes. Some of these designs are quite elaborate, and show considerable familiarity in working the material.

The sword — its hilt, its scabbard, its trimmings — was a favorite

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subject of decoration, and afforded opportunities for much beautiful work. Very frequently the ornamented parts were inlaid with gold and silver, while precious stones were also used on some of the more costly weapons. One sword shows a hilt of iron decorated with carved and raised notches, the one of bronze, the other of silver. In the matter of sword ornaments the artist gave himself most freedom. Here he was not hampered by any questions of utility, but let his fancy carry him where it willed. Buckles, pommels, belts, were

Fig. 809.—Ornament of gold for mouth of scabbard; real size.—Vestre Slidre, Norway. Weight, nearly 2½ oz.

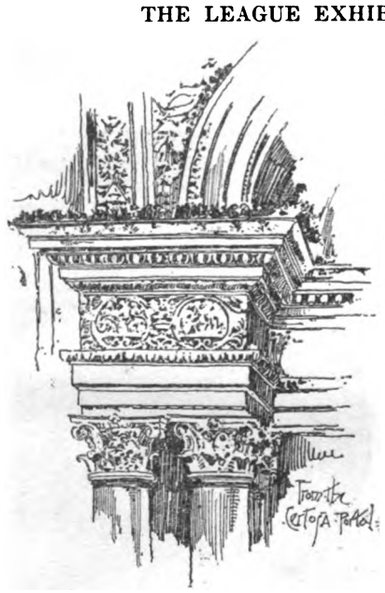
designed in the most elaborate style and finished with exquisite care. Gold ornaments that served as mouths for scabbards are of frequent occurrence, and were worked in most complicated designs. Even spear-heads and axes were ornamented, though probably such weapons were intended for decorative purposes or as rewards in martial contests rather than for actual use. Shields were also decorated with much skill, a favorite method being the insertion of bosses, often of precious metal and more or less delicately finished.

Barr Ferree.

[We desire to acknowledge the courtesy of the Messrs. Scribner which has enabled us to illustrate this paper with electrotypes from the original blocks. — Eds.]

[To be continued.]

THE LEAGUE EXHIBITION. — I.



We suppose that the Cincinnati Exhibition of November must have detracted somewhat from the League show, for the latter is hardly as full as usual. We cannot call it less interesting, for the collection of cathedral designs makes it in some respects the most remarkable yet held, but we miss something of the number and variety of sketches, from all sorts of hands, which have hitherto made the League exhibition the best annual exponent of the progress of American art to be seen anywhere. In saying this, however, we would not suggest that the value of the exhibition shows signs of declining, on the contrary, the earnest and admirably written introduction to the catalogue shows that the League understands better than ever its mission as the promoter and exponent of the application of fine art to American life, and it can but proceed always more energetically and effectively as it finds the path which its efforts can best take more clearly defined before it.

First to attract the attention of the visitor, as well as first in importance from any point of view, are the competitive designs for the New York cathedral, which hang all about the ante-room. The four designs selected for the second competition, naturally enough, are not shown, and some others, which we should have liked to see, are missing, but thirty-six or thirty-seven plans, with accompanying elevations and perspectives, give us an excellent idea, not only of the interest which the competition excited in the profession, but the success with which our architects solved the problem. We must say, as a preliminary, that the architects seem to have spent more thought on the subject than the Trustees, for few important competitions take place, and none ought ever to take place, in which the competitors seem to have been so entirely at sea as to the kind of drawings required of them. One would have supposed that the competition programme, which specified that the plans, elevations and perspective should be at a scale of one-sixteenth inch to a foot, was definite enough, but we find plans of all sizes, the smallest of which would not cover one-fourth the area of the larger ones. The perspectives are even worse, and all idea of scale seems to have been laid aside by some of the draughtsmen. Still more strange, however, is the interpretation put by many of the competitors on the stipulation that the drawings should be all in black-and-white line, without brush-work or shading. Several of the designs are shown, plan included, by drawings in brown, while Messrs. Cady & Company's and Mr. Congdon's perspectives shine in all the glories of full and elaborate water-color, and one or two others are daubed with what appears to be intended as a sketchy color effect. Even among the pen-and-ink perspectives, many are fully rendered, and the shadows cast, while a few, only a minority of the whole, keep strictly to the pure line-work required. It must be confessed that the last, the conscientious ones, are the best. Architects know well enough that an effective drawing in pure outline involves more skill and care than a shaded one, and generally take great pleasure in a successful piece of work of the kind, but laymen do not understand drawings in the same way, and in a mixed collection, only the highly-rendered ones, which jump from their frames at the beholder, have much chance of attracting non-professional attention, so that it was really, as well as technically, unfair and improper, to admit any shaded or colored drawings whatever to the competition. So far as we can see, the instructions distinctly excluded everything of the kind, and even the blacking of the windows, about which there is often a question, but which was indulged in by at least half the competitors, was, as we were informed by an official letter from the Trustees, forbidden. We suppose that the Trustees would be surprised to have a demand made upon them by all the competitors who adhered to the conditions, for the value of the work upon their drawings, as damages for the violation of the contract of competition by the admission of designs not rendered as the conditions stipulated, and no one would think of making such a poor return for the Trustees' unselfish and well-intended efforts, but such a demand would have a tolerable chance of success.

Laying aside this question, which we hope may never be brought up, we will devote ourselves to the designs themselves. As a rule, these are certainly highly creditable to the profession in America. It is to be regretted that the English and French competitive drawings were not shown, for comparison with ours, but we doubt very much whether the English designs were more refined and scholarly than that of Mr. Withers, or whether any of the French ones surpassed in interest and architectural quality that of Messrs. Carrère & Hastings.

This last, out of all the designs shown, must certainly be placed first as a work of art, although we cannot avoid a certain astonishment that any New York architects should have imagined that such an arrangement would commend itself to the Trustees of a Protestant Episcopal Church in this country. The very plan, so masterly in the skill with which a complex group of parts is combined into what appears to be a simple, though rich and artistic scheme, is redolent of incense, and, to the architect, the rows of lateral chapels, and the imposing arrangement of the choir, suggest the clusters of sparkling candles, and the varied life and color of a great Roman Catholic Church, far more than Protestant rectitude and sobriety.

What is the brilliant designer's loss is, perhaps the profession's gain, and we may well rejoice that so splendid a piece of work can be freely shown for our edification. As with most of the best designs, the drawings conform strictly to the terms of the competition circular, but they are marvels of pure outline rendering. Mr. Schladermundt is said to have been the draughtsman, and not even from Mr. Richardson's famous office do we remember a more magnificent piece of work.

The "mosaic" of the plan, in ink of exactly the right depth, forming patterns lovely in themselves, suitable in scale, and combining to perfection with the "poché" solids, is a model which young designers will do well to study, but even this is, to our mind, almost surpassed by the light-ink rendering in the section, whose wonderful beauty and delicacy must be seen to be appreciated.

Next to the splendid work of Messrs. Carrère & Hastings we are inclined to place Mr. Gibson's cathedral design, shown by a perspective view and section, and a very good and interesting plan. The perspective is fully rendered in pen-and-ink, and the shadows cast, rather to the disadvantage of the design, we think, although the drawing is, of course, thus much more conspicuous. The style is French Gothic, late in type, but not obtrusively flamboyant, and the outline and details are studied with a care and knowledge which is very charming; one could not help thinking that the projecting west porch, designating it in conformity with the usual orientation, beautifully studied as it is, injured the outline, and that a more solid treatment of that portion would have added greatly to the expression of a very noble, as well as picturesque mass. In a different style, but equally refined and scholarly, is Mr. Withers's design, shown only by a front elevation and a perspective, in pure English Gothic, immediately recalling Mr. Pearson's work, and similar in many respects to the new Truro Cathedral. Mr. Hazlett has also a well-studied Gothic design, very satisfactory in the correctness of the detail and proportions, though perhaps a little cold. One of the sets of drawings to which we turn with the highest anticipation is that of Messrs. Peabody & Stearns, whose drawings, a little inconspicuous, though the faithfulness with which they have kept to the contract in regard to rendering, show a design less highly flavored with incense than some of the others, but which presents a large Episcopal Church, most skilfully and conveniently planned, and with a graceful and dignified exterior. To the church is attached a clergy-house, which forms a charming addition to the perspective.

Among the Romanesque designs, one of the best is that by Mr.

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Glenn Brown, whose perspective only needs two western spires, as good in their way as his central tower, to be a very noble conception. Mr. Warren has also a good set of Romanesque drawings, with a particularly successful central dome, one of the best things in the room. Messrs. Cady & Company also show a plan with a dome in a Romanesque, or perhaps better, an indeterminate style, covered with row upon row of interlacing arcades, which are rather monotonous applied as decoration to so large a surface, and, when they come to be bent over on their backs in the upper portions of the dome, are positively disagreeable to the architectural instinct. This design, by the way, is shown in a highly colored perspective, rendered by Mr. Hughson Hawley, and forms one of the most conspicuous objects in the room, although the brilliancy of the coloring does not, to the expert eye, conceal a certain poverty of detail, and it positively increases the paltry, model-like look which an excess of foreground, and a bad arrangement of horizon and vanishing-points, give to the representation of the building. Messrs. Cady & Company's floor-plan is unobjectionable, although one entrance, however spacious, is hardly enough for the audience end of so large a church.

Two floor-plans, which attract attention by their beauty, and by their rendering in brown ink, are tolerably faithful reproductions, rendering and all, of Mr. Richardson's plan for the Albany Cathedral, but are accompanied by elevations hardly so successful as his. One of these, in Romanesque, well rendered, but heavy, is by Messrs. Cram & Wentworth, of Boston, who have an alternative scheme, made up of an aggregation of parts, like a country's carpenter's plan for a house, with hardly an attempt at the most rudimentary disposition, and as different as possible from the masterly handling of the Richardsonian plan. The other admirer of the Albany design, Mr. John Lyman Faxon, also joins with his floor-plan a Romanesque elevation, a little massive, and too hastily studied, but interesting, and worthy of being shown by a better arranged perspective.

Thus far, the artists whom we have mentioned have shown what some people call a slavish and un-American adherence to precedent in designing the details of at least their elevations, but there are some who have exhibited a freer spirit, and have exhibited designs the like of which no man ever saw before. Prominent among these is an architect of New York, who has conceived the idea of covering the nave of his cathedral with two invisible domes, which are duly indicated on the plan, with the supporting cross-arches and pendentives, but do not appear through the roof in the perspective, although the roof is so flat, and the cornice so low, that any dome with a rise equal to that of a saucer must project through it. The attention of the uncritical is, however, on looking at the perspective, diverted from its lack of correspondence with the plan by the colossal dimensions of the clearstory arches, which have a span of about ninety feet, and contain each a single window. Of course, we know that it is mere prejudice which makes us dislike to see two bays where the slavish imitators of mediævalism would put ten, but it cannot be denied that the novel arrangement is unfavorable to the scale, as well as the interest of the building, and the lack of the latter element is not satisfactorily supplied by a sickly yellow dome, as round and bare as a turnip, which rises, or, more properly, bulges, from the crossing of nave and transepts. In regard to rendering, the author of the design seems to have begun his perspective in line, and to have got the outlines inked-in, when it occurred to him to use color, which he apparently applied in about two minutes, on top of the ink, leaving all the different tints, together with the ink, to mix themselves in a friendly puddle as seemed to them best.

Another original design is that of Mr. Jennings, of New York, to whom it has occurred to illuminate his church chiefly by means of vast mullioned windows, which are scattered all over it, from the tops of the towers downward, while the convenience of the congregation is promoted by no less than nine spacious portals at or near the the west end.

There are still other eccentricities in the way of design, as well as many good and interesting plans, in Gothic, Romanesque and Renaissance, which we have not mentioned, but we will neglect these, to make room for a little of the moralizing suggested to us by the comparison of the drawings. In the first place, a large part of the competitors did not half try. Many, in fact most of the designs would have been enormously improved, both in plan and elevation, by further study, not always by a few hours more of sleepy brooding over the drawings, but by the active, wideawake comparison of executed buildings, the accumulation of ideas from all possible sources, and the patient labor with tracing-paper and India rubber, by which a great architectural design on paper grows into shape. Even where the ground-plan had been digested until the crude inequalities of spacing, and angular collision of lines, which mark a raw plan, had disappeared, the execution of the drawings was often feeble and student-like, or coarse and slashing, to the great detriment of the effect. In this case, the singular diversity of rendering made comparison more difficult, but even among the pure line-drawings there were few that exhibited all the resources of the art. In the second place, it was certainly unfortunate that the programme of competition did not give some idea of the intended cost of the building. Those competitors who were of a practical turn of mind probably at once assumed a sum for themselves, as the probable limit of the amount that could be raised in the next twenty or thirty years for the erection of the building, leaving the decoration to be paid for by the next generation. Probably this estimate varied greatly, according to the enthusiasm of the person who made it, but as St. Patrick's Cathedral in New York cost, we suppose, about four million dollars, and took nearly thirty years to build, it is likely that most of the architects who thought anything about it assumed that three millions would be a reasonable sum for the very much smaller body of Episcopalians to raise in the same period, and as they would certainly wish to use solid materials throughout, instead of the lath-and-plaster of the interior of St. Patrick's, they would naturally form the conception of a simpler, although larger building. This reasoning inevitably placed a distinct boundary between the designs of those who used it, and those of the architects who, for once, threw estimates to the winds, and allowed their imagination free run. With some of these, it is hardly too much to say that twenty millions would not suffice to carry their ideas into execution. Compared with some of the plans, Mr. Richardson's design for the Albany Cathedral is small and simple, yet the cost of this is said to have been actually estimated at five millions. We know that the New York Episcopalians are rich and generous, but we remember also that it is about twenty-three years since the cathedral project was so seriously talked about that Mr. Richardson himself was consulted in regard to the plan. During the subsequent period, nearly a quarter of a century, the Wolfe bequest is the first substantial contribution which has been received toward the building; and, at the same rate of progress, it will be some centuries before money enough has been raised to finish and decorate the entire structure.

[To be continued.]

CANADA

THE INTERNATIONAL EDITION.—DEATH OF MR. G. F. DURAND, ARCHITECT.—THE EXEMPTION OF ROMAN CATHOLIC PROPERTY FROM TAXATION.—WHAT TORONTO WILL DO WITH THE INCOME FROM THE STREET RAILWAYS.—A STUDENTS' ASSOCIATION.—A NEW COMPOUND OF NICKEL WITH STEEL.

I THINK that I cannot begin my first letter this year without a tribute to the very enterprising spirit of this journal. Many architects are waiting with great interest to see the first copy of the new departure, the International Edition, and the fact that its existence is owing to the promised subscriptions of a large body of architects, who recognizing the value of such a journal, rely upon the word of the editors as to its character and promise their support, ought to reassure the more timid members of the profession that it is in their interest also to make it a thorough success. At the time of writing the first copy is probably in the press, and, as it emerges therefrom, I am sure it will be received with applause.

The local press greets with satisfaction the work of the Ontario Association of Architects in reference to the better safeguarding of the public against such evils as arise through the ignorance of uneducated and only so-called architects. But, in describing the work of an architect of the present day, the leading Toronto paper has an article on "style," which, if it is to be taken as a sample of knowledge of the general public on the subject, is so lamentable that the amusement it first arouses is speedily changed into a sigh of regret. The architect of the day "must be able to give us a design that shall combine within itself the simple grandeur of the Classic, the airy grace of the most perfect Gothic, the calm repose of the choicest Italian, with a dash of Queen Anne or Modern Bizarre indescribable thrown in, if necessary, to please the jaded taste of these degenerate days." Alas! that in such an age of education as ours is, one could be found to perpetrate such nonsense! It is to be hoped that some philanthropist will take this poor wretch in hand and show him the error of his ways.

"In life remember death." In the midst of the satisfaction indulged in by the Ontario Association of Architects since the first convention held in November, on account of its success, they have to deplore the almost sudden decease of one of their re-elected Vice-Presidents, Mr. George Durand, of London, Ontario. Mr. Durand was taken ill early in December, and died within a fortnight. The principal work he was engaged upon at the time of his death was the new building for the Upper Canada college in Toronto.

The movement to put an end to the exemption of Roman Catholic property in Montreal from taxation is beginning to take definite shape. The Roman Catholic aldermen of the city are taking a leading part in the matter, and through their means a bill will soon be introduced into the Quebec Parliament with this object in view. It was first reported that this exempted property was valued at not less than nineteen millions of dollars. The actual figures are not quite so high, being $17,921,665, or nearly one-sixth of the total value of the property in Montreal The Seminary of Montreal holds the greatest proportion of this property, and is reported to be richer than the Bank of Montreal, with its $12,000,000 capital. It enjoys all the privileges of the city, and yet it does not pay one cent of the taxes. The Seminary obtained the seignory of the island of Montreal for the purpose of providing education, and while to a great extent

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this work is over, they still retain their privileges. The charter provides that it shall expend its revenues for the benefit of the city, and make reports thereon, but for the last forty years the Seminary has withheld its reports, and considerable sums are expended out of the country. The Government has to pay from $80 to $100 for each orphan cared for by the Seminary, which moreover, refuses to take in any child unpaid for. This is a question of the greatest importance to the Province of Quebec, and upon the solution will depend in a great measure the earlier or later "Anglicizing" (pardon the word) of the Province. The real estate of Montreal is assessed at $109,456,000, while that of Toronto is assessed at $122,651,000.

The city of Toronto has just reached that period of existence, common to all colonnial cities, when after an era of utilitarianism, its inhabitants have awakened to the fact that it is to their own personal advantage to set about the adornment of their city. In a couple of years' time an income of about $20,000 will become the property of the city, on account of the termination of the Street Railway Company's Charter. Public spirit is beginning to assert itself beyond individual interests, and as a result a movement is on foot to bring about the preservation forever of such open grounds and spaces which at present beautify the city but which may any time be taxed and consequently sold for building purposes. The grounds round the Cathedral, the old parliament-house, Queen's Park and other places are particularly aimed at in this scheme, and it is proposed to lay out these grounds, erect statues to prominent men of the Province, and to build museums and start an art collection. Such an opportunity as this is not to be lost. The $20,000 must be expended somehow, and it is very doubtful whether there is any way in which it could be laid out that would result in greater benefit to Toronto.

The students in Toronto have at last set about the establishment of an "Architectural Club" which is to take the form of a "students' association," but enlarged to include practising architects. The intention is to have a room where the youths can meet and see the journals and discuss subjects in connection with their work; to have classes for drawing, monthly competitions, lectures and so on, for they have at last been aroused to the fact that there is a great deal for them to learn outside their employers' offices. Drawing-classes will be commenced at once in a room temporarily provided. There is no reason why if the students are only energetic and earnest enough there should not be a first-rate students' association there.

A discovery that may be truly described as wonderful, in its probable results, has been made at Sudbury, Ontario. Copper mines have been worked there for a good while and platinum is found in the same mines, but the metal nickel is also found there in an enormous quantity, so great that it is said one month's output would supply a year's demand from all parts of the world. But this is not all: in preparation of the alloys, it is found that certain proportions of nickel and steel produce a compound with characteristics that will in all probability revolutionize the steel interest. Nickel is not an expensive metal and this compound of nickel and steel can be produced at a far less cost than best Bessamer steel, while it is not only suitable for every use to which that metal is applied, but is very superior to it.

The sum of one million dollars has recently been voted in Montreal for the improvements of the quay and landing-stages and wharves,— for the widening of approaches, and for the construction of permanent works to protect the city from the floods.

LONDON

MR. WATERHOUSE'S ANNUAL ADDRESS BEFORE THE R. I. B. A.—LORD GRIMTHORPE AND ST. ALBAN'S ABBEY. — THE CONTEST OVER ST. SAVIOUR'S, LONDON. — THE EXCAVATIONS ON THE ACROPOLIS. — PROPOSED SUBWAY UNDER OXFORD STREET.

THE Presidential address of Mr. Waterhouse delivered to the Royal Institute of British Architects was very full of interest. The President commenced by referring to statistics, and showing that the growth of the Institute in numbers and in power was a very real fact, despite the ill-advised attacks that are from time to time being made upon it by a certain section of the profession. Referring briefly to the want of recognition which architecture received from the State, he then went on to quote the following most interesting extract from the work of the eminent German, Dr. Reichensperger: "The well-known aversion of the English to bureaucratic over-governmentation exhibits itself even in the domain of art, especially in that of architecture. There is on the other side of the Channel no hierarchically classified and betitled band of architectural officials; neither do we meet in England with establishments founded and supported by the State for the education of architectural students, nor with governmental examinations, nor with official diplomas thereupon granted. Nevertheless, the English continue to execute architectural works of all kinds, not only in no respect inferior to our own, but, in my estimation, actually superior from an æsthetic point-of-view." This tribute to English work was received with great applause.

Two or three minor matters having received the President's attention, he next considered an attack which had recently been made on the scope of the Institute examinations by the Professor of Architecture at the Royal Academy. The Professor, as you may remember, has given utterance to views in which he expresses the opinion that all historical and strictly archæological questions should be cut out from the examination, which should simply test the student's capabilities as a building constructor. Mr. Waterhouse said that, though he disagreed with the Professor to this extent, that he thought it would be most desirable for every architect to know a little about the styles which have brought architecture to its present position, it was most important that the examinations should never have anything about them likely to fetter the student in any way; and he thought that, under the present system, the utmost freedom was allowed their students in all that concerned the inventive side of their art. It was better to encourage independent judgment and invention in devising means to a prescribed end than any slavish conformity to ancient precedents. But they would be very unwise to refuse to take advantage of the accumulated experiences of the past, or to completely sever that tie of tradition which made the acquisition of architectural knowledge partly a study of history, and connected from age to age with the life of a nation. The Paris Exhibition and the London County Council having received a due share of attention, Mr. Waterhouse turned to the subject, "annually becoming more urgent and irrepressible," of professional education, in which Mr. Stokes's Presidential address to the Architectural Association came in for a full share of attention. The Association itself was very highly praised. Its method of teaching "had had remarkable results." "The Architectural Association," said Mr. Waterhouse, "had been a great success, and it was still so much a success that he hoped every one of the non-metropolitan societies allied to the Institute would soon have connected with it an association of juniors, similarly constituted, and doing equally beneficial work. Without such teaching bodies to feed a professional society, not only education languishes, but the society itself might die of inanition." But Mr. Waterhouse was not content with fair words. He also gave an intimation that an appeal for pecuniary help would not be allowed to pass unheeded, and said that he believed that the senior and representative body of the architectural profession would do wisely, if the way could be made clear, to give substantial help to those who, during a long and prosperous period, had shown an earnest determination to help themselves. A note of warning was, however, addressed to those who are agitating for a more academical method of teaching architecture, and of either abolishing pupilage or modifying it out of all recognition. If a college of architecture, heavily endowed, were to descend upon them from the skies, he was not certain that it would be an unmixed blessing. Thoughtful critics among their Continental brethren appeared to agree that there was something in the freedom of English study and practice which was at the bottom of the good results they had been willing to signalize. Let them not, therefore, hastily throw away their birthright. Let them examine the student to ascertain whether he possessed at least a minimum of technical education — that he was able to make a respectable drawing, and to design a fit and convenient building. When that has been ascertained, the sooner the student was left to his own devices the sooner he would develop his inventive faculty and his artistic judgment. At present, in England, the students came under different influences, and were early thrown to a certain extent on their own resources. They did not all drink at one fountain, as would be the case if they had a Heaven-descended college; and, in consequence, there was more individuality about English work than could be found generally in the modern architecture of France and other Continental countries long in possession of that home of architectural learning for which some of them sighed. Mr. Waterhouse, on a more careful consideration of the question, might, perhaps, have found cause to modify some of his opinions, but they were expressed in a manner almost faultless, except, perhaps, the adjective "Heaven-descended."

The address was continued by a return to the President's first love, the shortcomings of the State, and a general congratulation on the progress of the profession, morally and artistically, formed a graceful termination to a careful and very considerate and thoughtful Presidential address.

An important decision has been given with respect to St. Alban's Abbey and its rival restorers, Lord Grimthorpe and Mr. H. H. Gibbs. To make this dispute more clear, I will give you a brief account of the history of this restoration of St. Alban's Abbey. In the year 1875 the bishopric of St. Alban's was set up, but the Abbey Church assigned to be the seat of the bishop's chair was in a state of profound decay — almost in ruins. Of course, this state of things could not go on, and in 1877 a committee, of which certain clerical authorities and Lord Grimthorpe (then Sir Edmund Beckett, Q. C.) were members, received a faculty to "restore, repair and refit." This word "faculty," I may explain, is a term given to a legal authorization which it is necessary to obtain in England before making any alteration to the material fabric of an ecclesiastical edifice, and to make such alterations without this faculty exposes the offender to a severe legal penalty. This restoration-committee went on with the work fairly well till 1880, when funds failed and the work flagged. Now my Lord Grimthorpe saw his opportunity.

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He came forward with an offer of undoubted generosity, to bear the whole expense of restoring the Abbey, but he made one condition: if his offer to complete the work were accepted, it must be done in his own way. He was not going to be trammelled by the views of this or that committee. The restoration-committee were, consequently, in a great dilemma. It was a case of "*aut Cæsar, aut nihil,*" and the committee chose Cæsar. So Lord Grimthorpe obtained his faculty, which continued in him the authority given to the defunct committee. My lord no sooner finding himself in power than he began to use his authority in a very arbitrary way. He began by decidedly objecting to all architects, and by setting up Lord Grimthorpe to reign in their stead. But alas! the new king far exceeded the wickedness of the old ones, and consequently dreadful have been the monstrosities with which his lordship has defaced the Abbey. Protests and threats have alike been in vain, and my lord has gone on from bad to worse, till there is little of the old Abbey which has escaped the hands of the destroyer. Some time ago, however, Mr. H. H. Gibbs appeared on the scene and took in hand the altar-screen, which he restored very carefully under the direction of Sir Arthur Blomfield. This finished, he proposed to continue his good work in the Lady Chapel, but Lord Grimthorpe stared aghast at any one presuming to intrude so far on his domain. It really could not be permitted. So Mr. Gibbs appealed to the court, arguing that a Lady Chapel did not come under the faculty granted in respect of a whole abbey. The decision of the court was in favor of my Lord Grimthorpe, and so it seems that, under our English laws, the work of destruction will go merrily on, despite the protests of bishop, rector, church-wardens and, I suppose, nearly every person of eminence in England's artistic coteries, for the term of my Lord Grimthorpe's natural life.

An interesting venture into the dubious field of "profit-sharing" has been recently made by the contractors to the new Cane Hill Asylum, Messrs. Peto Bros. They have issued a circular, in which they propose to give the men one-quarter of the whole net profits on the contract in addition to their ordinary wages. They reserve the right to withdraw this concession from any man (1) who has earned less than £5 in their employ; (2) who, by strikes, careless work or neglect of duties, tends to diminish the profits on the job; (3) who by any means damages the character of the firm for good and honest work. This is a purely tentative scheme on Messrs. Peto Bros.'s part, but they intend to adopt it on all their works if it prove successful. Of course, it is not possible to foresee the issue of the proposal. A somewhat similar one emanating from one of the largest of the metropolitan gas-companies has caused the great strike of which you have doubtless heard through the daily papers, on the ground that it removes the men's present right of striking, which a British workman dearly cherishes. To a just mind, however, the attempt seems warmly commendable, and I quite hope it will prove successful, and so lead to that community of interest between labor and capital which we are all so anxious to see established.

The important church of S. Saviour's, Southwark, just on the south side of London Bridge, is about to be restored under the direction of Sir Arthur Blomfield at an estimated cost of £35,000. The choir of this church, buried among the markets and warehouses of "The Borough" is one of the most exquisite examples of early English architecture in this country. It is very pure and delicate and of beautiful proportion. The nave, however, of the old church was destroyed in 1839 by the Goths and Vandals who held sway over English art, and a hideous structure, about as ugly I suppose as it is possible for the ingenuity of man to conceive, was erected in its place, every detail the beautiful old work being wantonly destroyed. Worse than this: under one of those curious anomalies which are so frequent in the Anglican Church, the nave of the building belonged to one incumbent and the choir to another. The relations between these two gentlemen being strained, the nave was made a sort of opposition building. The level of the floor was raised many feet and a heavy wall was built cutting off all connection with the choir. An edifying spectacle! The matter now has been taken in hand by the Bishop of Rochester, who is working in his usual vigorous style, and there is every hope that the work will be begun in a short time, and that South London will have a Cathedral, rich in historic memories and second to none in architectural interest, and which will rank with many of our finest buildings.

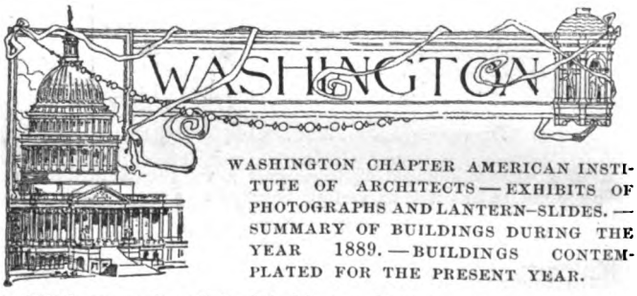
The students' work at the Academy was exhibited in the early part of December. The work of the architectural students was very poor in character and several of the more important prizes were not awarded for lack of satisfactory competitors. This seems to argue a very unsatisfactory state of things at the Academy so far as regards the architectural students, but as a matter-of-fact the painters on the governing body entirely overrule the objections of the small number of architects who hold a position thereon, with, I need not say, a lamentable result.

Two interesting papers have been read recently at the Royal Institute of British Architects, one by Mr. R. Elsey Smith, the Greek Travelling Student, and the other by Mr. David McGibbon. Mr. Smith's paper dealt with the recent discoveries of the British and German excavators on the Acropolis. He gave some interesting theories by Dr. Dörpfeldt on the intentions of Muesicles with regard to the Propylea, and went very fully into the Greek Theatres of Dionysos and Epidaneos, establishing the fact that the stage was originally not raised above the level of the orchestra. His excavations at Cyprus occupied a considerable portion of his paper, but his remarks were chiefly archæological. Mr. McGibbon investigated the interesting subject of Provençal architecture. Premising his remarks by a reference to the Phœnician and Greek influences which had probably been brought to bear on Provençal work, he took up in detail the Roman influence which is so strongly evidenced in the porches of Nôtre Dame at Avignon, S. Trophime at Arles and others. He then traced the gradual supersession of this by a native style which grew into luxuriance, was in its turn influenced by the ascetical Cistercian movement and then was choked, so to say, by the northern French Gothic. Both lectures were largely illustrated by means of lime-light views, which are not so much used in British architectural lectures as they deserve to be, and each may be termed an important addition to our existing historical knowledge.

A very sad thing has happened with regard to the new engineer to the London County Council, Mr. Joseph Gordon. He was only appointed a few months back, and gave up a lucrative position at Leicester for the appointment. One morning as he was in his usual omnibus going to the Council, he was seized with sudden illness and died immediately. The sudden nature of the event has given great pain to all his many friends. Mr. Clement Dunscombe has, after a lot of unseemly wrangling, been appointed to the position.

Among the schemes for submission to Parliament next session is a Central London subway, to extend, under the whole length of Oxford Street and Holborn to King William Street. A somewhat similar bill was promoted last session, but it was not passed as the occupiers on the line of route objected on the ground that the excavations would probably permit their houses to settle. This difficulty has been superseded by a proposal to bore the tunnel through the solid clay some 40 feet below the surface, which, it is thought, will be cheaper and far more satisfactory than the former proposition. The new bill is however being opposed strenuously by the tradesmen of Oxford Street as its passing will probably seriously diminish the traffic. Another bill is being promoted by the London County Council for the purpose of constructing subways under the main arteries of traffic, for the purpose of containing the underground pipes and wires, which are now the cause of a continual and most annoying disturbance of the streets' surfaces.

The Sheffield competition which I told you of last month, has attracted 179 competitors, and two other competitions have recently been announced on almost precisely the same terms. The satisfaction which this competition has given to all concerned is most refreshing. In strange contrast, however, is the action of the Richmond Vestry, who in a recent competition actually took upon themselves to upset the decision of an eminent assessor, who had been appointed to decide upon the drawings, and gave the job to a man altogether unknown to the world and whose design though not bad, was certainly very far from the best.



WASHINGTON CHAPTER AMERICAN INSTITUTE OF ARCHITECTS — EXHIBITS OF PHOTOGRAPHS AND LANTERN-SLIDES. — SUMMARY OF BUILDINGS DURING THE YEAR 1889. — BUILDINGS CONTEMPLATED FOR THE PRESENT YEAR.

THE last meeting of the Washington Chapter was one of special interest, because of the arrangements made by the committee for entertaining the members who were present. Many readers will remember reproductions made in the English *Building News*, of photographs taken during the annual excursion of a body of architects, with descriptions and sketches from the same source. The amateur photographer of the party was Mr. John L. Robinson, A. R. H. A., an architect and of course a member of the association. Some three hundred of these photographs, made during the excursions of 1888 and 1889, were loaned to the Washington Chapter for exhibition. They were remarkably clear and sharp, and more interesting to architects than ones made by a professional photographer would have been, as best points-of-view and the most interesting and picturesque bits of detail were taken in. Technically, they were equal to any professional photographer's work that I have seen. Among the most interesting ones I might enumerate several views from Haddon Hall, Wollaton Hall, Sudbury Mansion, Lichfield, Ely, and Peterborough Cathedrals, Houghton Hall, Sandringham, and Oxburg Hall, Castle Acre Priory, and many others.

The architects were evidently out for pleasure as well as art, as we saw them grouped in the foreground of many of the photographs, their faces and attitudes always showing them full of, we might say, pranks and good humor. In one view they had made of themselves living statuary with which to fill the vacant niches in one of the old cathedrals.

The tariff on works of art (I do not know whether photographs would come under this head or not) was brought forcibly to our notice when these views arrived in this country. To get them through the Custom House, it was necessary for the Chapter to give bond in

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Baltimore to take and return them in a specified time. It was easier to pay the duty than to go through the red tape necessary to get them out free of duty. This is a good example of the short-sightedness of Congressional legislation: throwing all the obstacles possible in the way of its own citizens when they wish to increase their knowledge and refine their artistic taste. I hope that the association who have recently taken the steps towards obtaining the necessary legislation for abolishing the tariff on works of art, may soon be successful in this much needed reform.

After a view and discussion of the photographs there was an exhibition of lantern-slides, loaned by the Columbia College architectural department. The slides were selected so as to illustrate the round-arch architecture as shown in Southern Europe and the East. Two exterior and several interior views of Saint Sophia were cast upon the screen; Pisa and other Italian buildings; the porch of the church at Arles, and St. Giles, with other numerous examples, some sixty in all.

The Chapter then discussed and appointed a committee to wait on the District Commission and recommend that a new clause of the building regulations in reference to solid balustrades on front porches be changed so as to allow such a balustrade, provided it and the porch do not exceed seven feet in height, and do not project from the building line more than five feet. The commissioners seemed inclined to modify the regulations in accordance with this action.

There were a larger number of buildings erected during the year 1889 than during the year 1888, but the amount of money invested was larger in the previous year. The numerous large business buildings and handsome residences which were a feature of the year 1888 are lacking during the past year.

There were more six, seven, eight, and nine room houses built last year, than at any time in the history of the city. The largest number of these houses have been built in Northeast and Southeast Washington. In this section the ground has been cheap, compared with ground in the Northwest, so people with limited means and investors who believe in small houses have been turning their attention in that direction for the last few years.

Of course, improvements in the way of houses also bring improvements in the way of sidewalks, and all the improvements are making the Hill, or East Washington, take on a new aspect. There were over two hundred houses more built last year than in the year 1888. Below is a comparative list of dwellings for the two years.

	1889.	1888.
January	109	89
February	246	106
March	227	200
April	185	250
May	318	194
June	197	185
July	184	180
August	224	212
September	141	137
October	132	197
November	86	96
December	106	88

A little over a hundred of these cost more than ten thousand dollars, some twenty-five exceeding twenty-five thousand dollars in cost.

The larger class of business buildings have also been less conspicuous than during the year 1888. Among the more prominent ones are the Inter-Ocean office-building, in process of erection, to cost about $75,000, J. L. Smithmeyer, architect; Henry Strong's stores, $50,000, W. Bruce Gray, architect; Ruppert's office-building, $30,000, A. G. Meyers, architect. Among the public buildings [not Government] is the Columbia Athletic Club, $46,000, J. W. Wagner, architect; the Baptist Church on 16th Street, $70,000, Gray, architect; House of the Good Shepherd, $40,000; Car and Power House, $60.000.

The real-estate market seems to hold its own, as prices are firm, the owners evidently being able and willing to hold on. Washington, according to a real-estate man, is not subject to what may be called regular "booms," or to their antitheses "slumps," as there is too much property in the market to admit of boom prices: when prices get too high in one section, it is allowed to rest by investors, while they put their money in property in other localities. Suburban property acts as a check upon city property, and property in the Northeast keeps down extravagant prices in the Northwest. High prices on Capitol Hill drove investors Northwest some years ago, now high prices Northwest seems to be having the opposite tendency.

The coming year much is expected in the building line. Two Loan and Trust Companies have been organized with capitals of about one million dollars each, the stock of which has been rapidly bought up. They are both expected to build large buildings during the coming year. One has bought the corner of 9th and F Streets, giving two hundred thousand dollars for the ground, and their intention is to build a ten-story building, according to rumor. I have just heard that Mr. J. G. Hill is making the plans: cost to be $300,000. The National Union Insurance Company recently bought a lot on F Street, for $46,000, which they intend to improve by the erection of a fireproof building for offices. Mr. Glenn Brown is the architect. Work is expected to commence on this building early in February.

It looks very much as if Washington would this year get its United States Post-office Building. This post-office, handling as it does all the Government mail, is one of the most important in the country, yet it is bandied about from one place to another; now its quarters are in a miserable dilapidated old building, erected originally for a hotel. It was ordered into the court of the Pension Building last year, but the order was never executed. First, because the inaugural must be held therein, and second, the new post-office officials did not consider the place suitable. The Supreme Court is crying for a new building. Then there are the new buildings necessary for the Zoological Park.

The United States Government is renting buildings without number in all sections of the city. It seems a shortsighted policy to be paying rental on poor buildings, double what the interest would be on a good building, when it is hard to know what to do with the surplus, which is idle in the treasury. The architects and builders all seem to anticipate a prosperous year in 1890.

ELECTRICAL TERMS.

THE Boston *Transcript* has been at the pains to bring together the appended definitions of electrical terms:

Accumulator. — Storage or secondary battery, in which electricity has been carried and has been converted into chemical energy, being retransformed into electricity when the battery is put to use for the purpose of furnishing energy or light.

Ampère. — The unit of the strength of the current per second. It represents, perhaps, the volume of electricity, and its value is the quantity of the fluid which flows per second through one ohm of resistance when impelled by one volt of electro-motive force.

Anode. — The positive pole of a battery.

Arc. — The space between the points of the carbons in an electric light or lamp which is bridged by the current represented by the flame.

Armature. — The revolving arm of an electric generator.

Battery. — A primary-battery is one in which electricity is obtained through the decomposition of metals in chemical solutions. Zinc and copper may be the metals and sulphuric acid the chemical. Gold, silver, platinum, iron or tin may also be used as the metals and sal-ammoniac, bi-chromate of potash, nitric acid and sulphate of copper may also be used as the chemicals. The storage-battery is a cell of acidulated water, containing, for example, plates of lead. This arrangement has an electric current directed into it, which it will give back in almost an equal quantity when the energy is wanted. There are various methods and ways of making both primary and secondary or storage-batteries, but the above are the general principles governing their construction.

Brush. — The copper string which connects with the commutator of a dynamo and gathers the electricity for the conductors.

Candle. — Our unit of illuminating-power.

Carbons. — Rods of carbon are used in arc-lights for first establishing the current, and then, when withdrawn, form the arc over which the electric flame leaps. They are made of powdered coke by a secret process.

Cell. — The vessel in which chemical actions produces electricity.

Circuit. — The path along which an electric current travels.

Commutator. — The collector of the electricity generated, and from which the fluid is taken by the brushes.

Condenser. — An arrangement for collecting a large quantity of electricity on a small surface.

Conductivity. — The comparative ability of a substance to convey a current of electricity.

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Conductor. — Conveyers of the electric current, silver being the best, and copper next, in conductivity.

Core. — The iron that becomes magnetized in an electro-magnet. In helix, this iron is of the softest kind.

Coulomb. — The unit of dynamic quantity represented by one ampère of current.

Current. — The flow of electricity along a conductor. Its strength in ampères is found by dividing the electro-motive force in volts by the resistance in ohms.

Dynamo. — Machine for converting mechanical power into electrical energy.

Electrode. — A pole of a battery.

Electro-motive Force. — The power that constitutes or moves electricity.

Electro-magnet. — The soft iron core around which insulated wire is wound. It becomes highly magnetized when the current is sent through the coil, and is much more powerful than a permanent magnet, but its magnetism is lost when the current is broken.

Ferad. — The unit of electrical capacity.

Galvanometer. — An instrument for measuring an electric current and for detecting the presence of electricity.

Horse-power, Electrical. — A unit of power equalling 746 watts of electrical energy. A current of one ampère and 746 volts is an electrical horse-power.

Induction. — The property by which one body having electrical, galvanic or magnetic polarity causes it or induces it in another body without having actual contact. In other words, an impress of molecular force or conditions from one body on another without direct contact. An electric current in a wire induces currents in conductors parallel to it.

Insulators. — Substances possessing high resistance, such as glass, vulcanized rubber, paraffine, etc. When covering a wire along which an electric current is passing it prevents loss of power by induction, and makes the wires heavily charged safer for handling.

Jule. — The union of heat and work which is expended in forcing one coulomb through one ohm. It equals .7373 foot-pound.

Magnet. — A magnetized piece of iron or steel, capable of attracting iron or steel bodies, and of inducing electric currents.

Negative. — The terminal of a generator, where the positive current returns after traversing its circuit. Negative electricity is an amount less than the substance would naturally contain.

Ohm. — The unit of resistance represented by the resistance through which one ampère of current will flow at a pressure of one volt electro-motive force.

Polarity. — A magnet suspended so that its movements are unrestricted in any direction will turn one point to the North, the other to the South. Hence the North and South poles of the magnet.

Pole. — The terminal of a generator.

Positive. — The point of a generator where the positive current leaves it.

Potential. — Appliable electro-motive force corresponding to pressure or head in hydraulics.

Power. — The rate of doing work.

Resistance. — The opposition that a current meets in traversing a conductor.

Volt. — The unit of electro-motive force. One volt will force one ampère of current through one ohm of resistance.

Watt. — The units of electrical power represented by one volt multiplied by one ampère.

The unit of electrical-power, etc., are symbolized as follows:

Electric motive force or volt	E. M. F. or
Current or ampère	C.
Resistance or ohm	R.
Quantity or coulomb	Q.
Capacity or ferad	R.
Energy or joule	W.
Power or watt	P.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

"A FOUNTAIN OF ST. GEORGE," AFTER AN ETCHING BY AXEL H. HAIG.

[Photogravure on Japan paper.]

THIS plate is issued as a supplement to subscribers who have fulfilled the conditions announced in our issue of November 9 last. In our announcements we have followed the example of the leading print-sellers and called this print "The Fountain of St. George at Lubeck," but Mr. Haig writes us under date of December 26: "The subject is not to be found at Lubeck at all or in any North German town. The work is a composition partially founded on a scene in an old Bavarian town, but, being so very much an invention, I cannot give a locality to it."

UNITED STATES TRUST COMPANY'S BUILDING, WALL STREET, NEW YORK, N. Y. MR. R. W. GIBSON, ARCHITECT, NEW YORK, N. Y.

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TWO SHEETS OF SKETCHES BY A ROTCH TRAVELLING-SCHOLAR, MR. E. A. JOSSELYN.

[Issued only with the International and Imperial Editions.]

ST. REGULUS'S CHURCH AND TOWER, ST. ANDREWS, SCOTLAND.[1]

[Issued only with the International and Imperial Editions.]

"CLOSE to the vast fragments of the Metropolitan Cathedral of Scotland stand the ruins — if so a building can be termed of which the stonework is still nearly entire — of the more ancient Church of St. Regulus. Beside the red crumbling remains of the great fabric, this small simple church, so nearly complete, would, to a person, who saw them both for the first time, without any guides from history or the progress of architecture, convey a distinct idea that it is a more modern building than its majestic companion, which, built no one can tell precisely how many years later, has advanced much farther in decay, and may perhaps be level with the earth when the small relic of an older and simpler ecclesiastical system shall still subsist, to show how substantially, yet how simply, early Christianity took root in Scotland. It is a disputed question whether the Culdees, for whom the Church of St. Regulus is reported to have served as a place of worship, were under a hierarchical or a Presbyterian polity; but if architectural analogies were allowed to influence such an inquiry, whoever looked upon this old church would pronounce that the simplest forms of worship alone were pursued within its walls; and he might thus perhaps find a common simplicity, if not meagreness, characterizing alike the structures which preceded and those which followed the ages during which Gothic architecture and the Roman Catholic Church together triumphed.

"This building, which with all its plainness is singularly interesting, contrasts in every way with the cathedral. It is built with a cold gray stone, while the latter consists of a warm red. The walls of the cathedral have been massive, but ill-built, of rubble-work; those of the old church are thin, but remarkably well built, with courses of square hewn stone. The cathedral exhibits some scanty traces of ornaments; the old church retains all the decorations it seems to have ever possessed, and they are of the simplest and most unpretending character. The superior style of the mason-work accounts for the state of preservation in which this edifice has reached us. The body of the church is a simple parallelogram, with neither transept nor aisle. It has a wide arch over the doorway — simply circular, but without the massiveness of the Norman, and possessing a slightly nearer approach to the character of the pure Roman. It has been lighted by very small round-arched windows, which, probably having been unglazed, are pitched high in the wall, to prevent as much as possible the sufferings of the congregation from the cold east winds which seldom cease to blow on this exposed rock. The whole imparts, in the thinness of the walls, the want of ornament, and even the clean, regular character of the masonry, a cold and comfortless sensation, very different from the mingled feelings of solemnity and mysterious awe usually experienced within Gothic ecclesiastical edifices. Yet every lover of antiquity must feel gratified that this valuable relic has been allowed to remain in its present state; and that a dread, some time ago entertained, of the possibility of its being fitted up within in modern comfortable style was not realized.

"The square tower, fully represented in the plate, is a very conspicuous feature of this building, and its disproportioned size adds by contrast to the thinness and meagreness of the body of the church. Like the rest of the edifice, it is built in courses of finely hewn stone; and in this feature, along with some other details, it resembles the celebrated round towers of Scotland and Ireland, and at the same time has a good deal in common with those towers which in England are generally supposed to be of Saxon origin. The small windows, divided by shafts, have considerable resemblance to some like details in the round tower at Abernethy; and it is difficult to compare the two together without feeling the likelihood that they belong to the same age and class of architecture. Like the round towers, it was constructed without any internal stair or means of ascent — a want common also to the Saxon towers; but a substantial flight of stone steps has lately been made within the Tower of St. Regulus, from the top of which a noble view of the ancient archiepiscopal city and the surrounding country may be enjoyed.

"Like that of its circular brethren, the age of the foundation of this tower and the accompanying church, is matter of pure conjecture. Its legendary history, which has been embodied in the monkish chronicles, is, that in the year 307, Regulus, a monk of Achaia, being warned in a dream or vision that the Emperor Constantine intended to translate the relics of St. Andrew the Martyr, then deposited in Patræ, to Constantinople, removed a portion of them, with which he sailed westward, until he landed and found shelter on the barren rocks of the east coast of Scotland, where the metropolitan city subsequently reared her towers and spires. Between the cathedral and

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

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the castle there is a cave, entered from the sea, which has either been made or altered artificially, containing on one side a rude altar, and on the other an opening to an inner cavity. This was the first place of the saint's refuge, and subsequently became an object of pilgrimage, as described by Scott, in his "*Marmion*":

"But I have solemn vows to pay,
And may not linger by the way,
To fair St. Andrews bound;
Within the ocean-cave to pray,
Where good St. Rule his holy lay,
From midnight to the dawn of day,
Sung to the billows' sound."

"The legend, in continuation, imports that Regulus built the tower and church, now known by his name.[1] This account takes the date of the edifice to a period probably 400 years earlier than that of any building in Scotland of which the age is satisfactorily ascertained. There are no early authentic memorials of this church; but there is all reason to believe that it was the cathedral of the early bishops, until a sufficient portion of the greater edifice, begun in the middle of the twelfth century, was completed for public worship."

ST. SALVATOR'S CHURCH, ST. ANDREWS, SCOTLAND.

[Issued only with the International and Imperial Editions.]

"The Church of St. Salvator, or the Holy Saviour, more generally known as the College Church, runs along the north side of the main street of St. Andrews, having at its west end a tall square tower, surmounted by a hexagonal spire resembling that of Glasgow, but smaller and simpler, and at the east end an oriel of three lights. Though kept in a serviceable condition, it is a sad wreck of what it must at one time have been. The stone mullions of the windows, which, from the character of some of the remaining details of other parts, we may suppose to have been rich and beautiful, are all gone, and the arches are filled with panes of glass, held together by narrow wooden sockets, according to the practice of domestic architecture. Some niches and mouldings along the southern side still show defaced remains of old richness and beauty.

"The great progress which architecture had achieved in the western States of Europe, beyond all the other arts, which — after the work of the mason had come to a state of perfection vainly attempted to be imitated in later times — were merely struggling into existence and shape, gave the forms of architectural objects and devices a natural predominance in the other branches of textile art. The shape to which the edifice owed its strength and its surpassing beauty, was thus naturally adapted to many other purposes. The statue of the saint was surmounted by miniature emblems of the same pillars and groined arches which covered the lofty choir, and sculpture never appeared without being nearly buried in architecture, of which it was but a mere adjunct. On the sepulchral monuments, and on the fonts and other ecclesiastical utensils, the same forms were repeated. The devices were adapted to shrines, to gold and silver plate, to jewels, and other ornaments of attire — to chairs and tables, and other domestic furniture; and the illuminator of hour-books or saints' legends, having no better choice, transferred the tracery, by which he was on all sides surrounded, in gold and bright colors to his parchment.

"Besides their share of damage at the Reformation, the bishop's church and mausoleum suffered from an untoward incident, little more than eighty [125] years ago. From the massive character of the roof, some wise people began to dread that it would fall by its own weight, and proposed to anticipate such a catastrophe by taking it down. They found, however, after it was too late to preserve it, that it was too compact to be taken to pieces, and they were compelled, by severing its juncture with the wall-plates, to let it fall in one mass. The effect on the monument, and all the interior decorations, can easily be conceived.[2]"

ANNISTON CITY LAND COMPANY'S BUILDING, ANNISTON, ALA. MESSRS. CHISHOLM & GREEN, ARCHITECTS, ANNISTON, ALA.

DESIGN FOR AN OFFICE-BUILDING, BOSTON, MASS. MR. C. H. BLACKALL, ARCHITECT, BOSTON, MASS.

HOUSE FOR C. DE LACEY EVAN, ESQ., RUXTON, MD. MR. E. G. W. DIETRICH, ARCHITECT, NEW YORK, N. Y.

SKETCH FOR A HOTEL, NORTON, VA. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

[ADDITIONAL ILLUSTRATIONS IN THE INTERNATIONAL EDITION.]

INTERIOR OF THE CATHEDRAL, ALBI, FRANCE.

[Gelatine Plate.]

INTERIOR OF ST. PAUL EXTRA MUROS, ROME, ITALY.

[Gelatine Plate.]

[1] Martine, "*Reliquiæ Divi Andreæ*," 18. Lyon's "*Hist. of St. Andrews*," i. 17.
[2] Lyon's "*History of St. Andrews*," ii. 195.

HOUSE OF MRS. CONSINO, SANTIAGO, CHILI.

OFFICIAL RESIDENCE OF THE INTENDENTE OF THE PROVINCE, SANTIAGO, CHILI.

COOMBE WARREN, KINGSTON, ENGLAND. — THE DINING-ROOM. THE LATE GEORGE DEVEY, ARCHITECT.

COOMBE WARREN, KINGSTON, ENGLAND. — THE GARDEN. THE LATE GEORGE DEVEY, ARCHITECT.

ITALIAN SKETCHES.

WESLEYAN CHAPEL, HEADINGLY, LEEDS, ENG. MR. T. BUTLER WILSON, ARCHITECT.

In connection with the general alterations of this building, a new choir has been added, with minister's and choir vestry in the rear, with new porch to south transept. The choir-floor is laid with red church tiles; the communion floor is in Italian marble mosaic; the steps are in red Belgian marble. The base of pulpit has moulded plinth in blue Bolton Wood stone, polished alabaster shafts, with carved Caen caps. The upper part of pulpit and choir stalls are of wainscot oak throughout, with solid ebony shafts, cusped and moulded panels and richly-carved finishings of Late Decorated period.

SOCIETIES

MISSOURI STATE ASSOCIATION OF ARCHITECTS.

In order to secure a large attendance of the members of the Missouri State Association of Architects, and to hear from the Committee on formation of Chapter of the A. I. A., who are now in session in New York City, it has been decided by the Board of Trustees of the Missouri State Association of Architects to postpone the Annual Meeting (notices of which have already been sent out), from January 14 to Tuesday, February 11, 1890.

By order of Board of Trustees.

Jas. Oliver Hogg, *Secretary.*
E. F. Fassett, *President.*

PHILADELPHIA CHAPTER, A. I. A.

A meeting of the Chapter was held on the evening of December 17, 1889, the members present being the following:

Professionals, Messrs. Balderston, Boyden, Brown, Chandler, Hazlehurst, Mason, Prichett and Pursell.

Juniors, Milligan, Moss, Munoz and Zilenziger.

The Secretary's report of the last meeting was approved and the Chapter voted that the Secretary be instructed to tender to the Publishers of the *Builder, Decorator and Wood-Worker* the thanks of the Chapter, for the gratuitous printing of the minutes of the last meeting.

The Education Committee reported progress, and spent thirty minutes in discussion of the subject of education as voted at the last meeting.

The President suggested a series of classes in the Chapter rooms in branches closely allied to architectural study or practice, and on an informal basis; students to purchase tickets at twenty-five cents each, to be good for a lesson in any branch or course established. After some discussion as to the best way to organize these classes it was voted, on motion of Mr. Balderston, to refer the matter to the Executive Committee with instructions to act at once in the matter in connection with a committee of three to be appointed by the President.

The President appointed three Junior members, Messrs. Moss, Munoz and Milligan, to act respectively as President, Secretary and Treasurer, of the Junior Class Committee. It was decided to begin with a water-color class at once, to be open to any draughtsmen or architects, whether members of the Chapter or not.

To meet preliminary expenses the eight practising members present subscribed five dollars each and the four Junior members one dollar each for tickets.

In accordance with a vote at the last meeting, the President then delivered the following address.

Gentlemen of the Philadelphia Chapter of the American Institute of Architects:— There are in this city to-day more than one hundred and twenty practising architects; above one-fourth of this number are members of our Chapter and the few here to-night represent the active element of this organization.

This city alone — not including the country around it — spends upwards of thirty millions annually in the construction of small houses, factories, churches, banks, hotels and mercantile buildings — all, work that should engage the services of responsible architects, but of which not one-third at present comes under the proper guidance, in design or expenditure, of our profession. Two-thirds of the work is left to chance — perhaps a copy of what has been done, and

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to an endless repetition of poor construction and monotonous design — and on this account our city is now held in ridicule by the growing places of the North and West.

To combat this, the Chapter is now taking an active part. The future charm and beauty of this city depends very much upon the little band gathered here to-night. Such an opportunity has perhaps never happened in the history of the world before — when the expenditure of thirty millions yearly could be so easily directed for a good purpose, in pure and refined design, from the humblest dwelling to the stateliest monument of wealth and power. We can infuse this spirit, not only into buildings, but into all manufactures, more easily than any other group of designers — and give our city a name for design second to none in this or the old world.

We now complain that we have no National School, no opportunity for proper study; that our young men grow up in offices and plunge as soon as chance offers into active work where their time, we may think, is too interrupted to give proper attention to design. We must remember that the foremost architect of forty years ago was not equipped as well as a young knight of the T-Square is to-day — with photographs of all that the world possesses, papers that give good advice, and examples of pure work both old and new, easy communication with the great cities, and an abundance of means for the proper construction of his buildings. He already begins to wonder where it will end, and glimpses of a noble future are before his view.

If we wish to have a National School, it should be the object of the Chapter to do all it can to improve the designs of its members. Not only the junior members but all of us should ask for advice from each other. We are very sensitive, but is it not better to have our buildings criticised and even cruelly treated while on paper, than to construct them with their faults and leave monuments to our inability and a disgrace to the country.

Let the members of this Chapter design more together, let us try and forget the little faults or the possible infringement of rights by each other; try and cultivate a friendly criticism in our search for pure and noble design and we will be a great benefit and blessing to our city.

At the conclusion of the address, on motion of Mr. Mason, a resolution was passed thanking the President for the address and requesting a copy of same for insertion in the minutes of this meeting and for publication.

Mr. Edward Hurst Brown gave an interesting talk on a recent trip through Hereford, Shrewsbury, Truro and other English towns, illustrated by many Kodak views of scenery and architecture, and on motion of Mr. Mason the Chapter passed a vote of thanks for the entertainment thus afforded.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE INCOMES OF ARCHITECTS.

ST. LOUIS, MO., January 10, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — Apropos of your recent editorial upon the *New York Herald's* veracious testimony concerning the professional income of architects, the subjoined letter may be of interest. It was written to the *Herald* immediately after the appearance of the article referred to. It is, perhaps, hardly necessary to add that the reply asked for is still being awaited with more patience than confidence.

COPY.

ST. LOUIS, MO., December 18, 1889.

TO THE EDITORS OF THE NEW YORK HERALD.

Dear Sirs, — The *St. Louis Globe Democrat* of this morning, prints the inclosed clipping in which the *New York Herald* says, "It is perfectly safe to say that there are in the City of New York at least ten architects whose annual net income is in excess of $100,000, while in Philadelphia, Chicago, Boston and St. Louis there are quite as many who can spend a like amount of money every year without overdrawing their bank accounts."

Presuming that the *Herald* will not lend its high authority to statements it is not prepared to substantiate, also that this article means, what it appears to say, that the incomes named are derived from architectural fees, not from inherited wealth, real estate ventures or other outside sources, will the *Herald* in its columns or otherwise favor me with the names of the ten New York architects, whose practice yields them an "*annual net income in excess of* $100,000?" Will the *Herald* name ten New York architects whose *gross* professional income has exceeded or reached $100,000, per annum, for any ten or for any five consecutive years? Can it name such by adding Brooklyn and Jersey City to New York? Can it name ten architects in the whole United States whose annual net income from professional fees has been in excess of $100,000, or of $50,000 for any five years in succession?

The *Herald* says "*there are quite as many in Philadelphia, Boston, Chicago and St. Louis who can spend a like amount of money every year.*" Will the *Herald* name to me a single architect in St. Louis, who at any time derived from his practice a revenue of $100,000, per annum, or of half that amount? Will it name any ten or any five architects in Chicago or in Boston or in Philadelphia, who have earned $100,000, per annum, net income for three years in succession?

This letter is written in no controversial spirit, but in the persuasion that an attempt to procure the names asked will satisfy the *Herald* that it has been misinformed for once, and will lead to a correction in its columns of an article likely to create public odium against a severely over-worked and under-paid profession. Should these inquiries be answered affirmatively, I will undertake to have the reply published in the leading architectural journals of the country.

Very respectfully, C. E. ILLSLEY.

CEMETERY VAULTS.

JERSEY CITY, N. J., January 3, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — Will you please mention one or more publications upon the best methods of constructing cemetery vaults, and oblige,

SUBSCRIBER.

[M. GATEUIL'S "*Recueil pratique de Marbrerie et de Monuments funéraires de tous Styles*," or Brindley & Weatherley's "*Sepulchral Monuments*," or César Daly's "*L'Architecture funéraire contemporaine*," may contain the information you seek. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

PROPOSED HIGH-LEVEL BRIDGE FOR AMSTERDAM. — A short time ago the *Sun* described a curious bridge to be built on the Isle of Man, where, on account of the lay of the land, it was impossible to build the ordinary long and gradually ascending approach to one tower. To overcome the difficulty the tower of Babel idea was adopted. There is a curious adaptation of the same idea, under different circumstances, proposed at Amsterdam. This city lies in the form of a half circle on one side of the North Sea Canal. The growth of the city has been like that of New York, in that it has spread out in one direction. The people have objected to crossing the canal there, just as they objected to crossing North River here, on account of the delays in ferry travel. They talked about the building of a bridge for a time, but the shipping using the canal objected, especially as the land on each side of the canal was very low. A bridge lying low down, as the Third Avenue bridge does over the Harlem, would be an intolerable nuisance to shipping because it would have to be swung every time a tug came along. It would be of little benefit to land traffic also, because of the delays incident to an open draw, as those who have had occasion to cross Chicago's canal very well know. It was reserved for Mr. Gerard W. Schimmel to devise an acceptable plan. It includes two circular stone and steel towers, with a roadway winding about each until a sufficient height is reached. This roadway has a sidewalk eight feet wide, a wagon road nineteen feet eight inches, and a tram-car road-bed sixteen feet three inches wide. The tram-cars run in next to the tower, and the sidewalk is outside of all. Connecting the two towers is a common steel swing bridge, resting on a stone tower. The opening for boats is ninety-one feet wide and the swing bridge is forty-eight feet nine inches above the water. Winding once about the tower, which is 143 feet in diameter, gives a rise of thirteen feet nine inches. The towers are provided with elevators for those who do not wish to walk up. There is a waiting-room in each for passengers who are delayed when a big ship comes in. It is proposed also to utilize the space in the towers for stores of various kinds. — *New York Sun.*

A REMARKABLE WATER-POWER. — One of the most remarkable instances of electrical transmission of power has only recently been accomplished in the State of Nevada, on the world-famous Comstock Lode and the almost equally famous Sutro Tunnel. At the Nevada mill there is a ten-foot Pelton water-wheel, which receives water through a pipe-line delivering water from the side of Mount Davidson under a head of 460 feet, giving 200 horse-power. Here the water is again caught up, delivered into two heavy iron pipes and conducted down the vertical shaft and incline of the Chollar Mine to the Sutro Tunnel level, where it is again delivered to six Pelton water-wheels, this time running under a head of 1,680 feet. Each of the six wheels is but forty inches in diameter, weighing 225 pounds, but with a jet of water less than five-eighths of an inch in diameter they develop 125 horse-power each. On the same shaft, which revolves 900 times a minute, are coupled six Brush dynamos, which generate the current for the electric motors that drive the stamps in the mill above ground. The result is that, where it formerly took 312 miners' inches of water to operate thirty-five stamps, but seventy-two inches are now required to run sixty stamps. This is the most enormous head of water ever used by any wheel, and by itself constitutes an era in hydraulic engineering. A solid bar of iron thrown forcibly against this tremendous jet rebounds as though it had struck against a solid body instead of a mobile fluid. The speed of this jet, where it impinges against the buckets of the wheel, is *two miles* a minute — 176 feet a second. . . . There is another quality of these extraordinary wheels which renders them absolutely without a peer in the large family of prime-movers. This is the immense power exerted per pound of weight. Those in the Chollar Mine, for instance, give out one horse-power for every 1.8 pound of weight. If there is anywhere a motor which begins to compare with them in this respect, I have never been favored with knowledge of it. And it seems there is no limit, outside of that which sets bounds to the head of water itself,

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to prevent further progress of the wheel in the same direction. — *Alvan D. Brock, in the Overland Monthly.*

Damming the Straits of Belle Isle. — The Straits of Belle Isle dam is again being discussed, as having an important bearing upon the proposed extension of the Quebec and Montreal Railway to that point. Aside, from the convenience of connecting Newfoundland with the main land across such a dam, and thus securing the shortest possible sea voyage across the Atlantic, there are other important climatic effects expected to result. General Sir Selby Smith, in 1879, proposed to the Dominion government to divert the Arctic current from the Gulf of St. Lawrence by such a dam; and Lieutenant Maury is said to have suggested the same thing, and to have laid his plan before the British government over thirty years ago. These straits receive the direct flow of the polar current from Baffin's Bay. If this current could be shunted off into the open ocean, and the branch that now passes through the gulf be prevented from shouldering off the warmer waters of the gulf stream, as is now the case, such a change would very sensibly affect the entire gulf and its adjacent shores. — *Engineering News.*

Woodwork and Steam-pipes. — If there had been any doubt that wood touching a steam-pipe is liable to be charred, if not ignited, by the heat of the steam, that point would now be set at rest by an inspection of the trench recently dug in Broadway by the steam-power company. The wooden coverings of the pipes, which had been buried for several years underground, were, when removed, found to have been converted into charcoal on the inside to the depth of half an inch or more. In buildings, the woodwork in the immediate vicinity of live steam-pipes should be protected carefully. — *Boston Transcript.*

Plaster-of-Paris and Marshmallow. — According to a French authority, much of the inconvenience arising from the too rapid consolidation of plaster-of-Paris may be remedied by the simple addition to the mass of from two to four per cent of marshmallow root, finely powdered. With this treatment it is found the plaster will not set for an hour at least; and, moreover, the mixture becomes so hard, on drying, that it may be sawed, filed, or turned, and in this condition is applicable to the manufacture of dominoes, dice, and numerous other small articles. — *Exchange.*

THE LATE JOHN McARTHUR, JR.

At a special meeting of the Commissioners for the Erection of the Public Buildings, held on Thursday, January 9, 1890, the President laid before the meeting a letter from Mr. Grayson P. McArthur, eldest son of John McArthur, Jr., announcing the death of his father. On motion of Mr. Wm. H. Wright, the President was requested to appoint a committee to prepare a suitable Minute and Resolutions. The President appointed Messrs. Wright, Miller and Gaskill, to whom, on motion of Mr. Miller, the President was added, and the committee reported the following Minute and Resolutions, which were unanimously adopted: —

The Commissioners for the Erection of the Public Buildings having heard with deep sorrow of the death, on the 8th instant, of John McArthur, Jr., who for nearly twenty years had served as their architect, direct the following minute to be entered upon the records of the Commission: John McArthur, Jr., was elected Architect of the Commissioners, September 15, 1870. The Act of the Legislature creating the Commission had been approved by the Governor August 5, 1870; their first meeting was held August 27, 1870, when a temporary organization was effected; and on October 4, 1870, the Commissioners permanently organized. And from the date of his election, midway between the first meeting of the Commissioners and the meeting when they permanently organized, down to the day of his death, John McArthur, Jr. has been continued without dissent or opposition, by successive annual elections, during nineteen years, architect of the City-hall of Philadelphia, which is approaching final completion. His election was due not only to the eminent general reputation and character which he had acquired as an architect, but to his special attainments, which he had reached in direct reference to the erection of buildings suitable to the Municipal requirements of this great and growing city. For over ten years this subject had been his study, and in the earlier attempts, partially put into execution, he had been the architect employed. With the passage of the Act of August 5, 1870, and his election as architect, under the Commission thereby created, of the buildings required to be erected, he at once threw himself, with all the energies of a thoroughly equipped professional mind, of a mature judgment, of a ripe and multiform experience, of a special and practical study of the immediate subject, and of a just enthusiasm, of a personal ambition, civic pride, and of rare concentration of aim and purpose, into the fulfilment of the duties of his position. From the very inception of the undertaking he has devoted himself with unswerving fidelity, industry and integrity to the responsible and complicated labors incident to his office. The records of the Commission throughout these score of years bear testimony for all future time to his many invaluable services up to the very fullest requirement of every accountability, and beyond any mere "nominated-in-the-bond" demands.

He was considerate, kind, patient, conciliatory, affable and courteous, with an equable and unruffled sweetness of temper under all circumstances, however trying, and yet with a firm and inflexible uprightness and integrity in the direction of the right and truth in decision and action. With the Commission and all their officers; with the numerous contractors and all the employés in the construction of the buildings; with the heads of departments occupying or earnestly pressing claims to be admitted to occupancy of the building; in the midst of trying financial questions and all the intricacies of the complications involved in the peculiar relations of the Commission towards the legislature, the City Councils and the people of this municipality, he ever preserved a justly balanced and strict regard for the interests of all concerned; but always keeping steadily in view the end contemplated by the Act of Assembly by which the Commission was created, and the completion of "the buildings required to accommodate the courts and for all municipal purposes in the City of Philadelphia."

The Commissioners hereby express their appreciation of all the noble qualities of his character as exemplified in his long and faithful career as their architect; their personal regard and esteem for him as a man and an upright public servant; and their sincere sorrow at his removal by death from the scene of his labors before their final completion. And they do hereby adopt the following resolutions:

1. *Resolved*, That the Commissioners for the Erection of the Public Buildings do most sincerely sympathize with the widow and family of their deceased architect and friend, John McArthur, Jr., in their sore bereavement and deep sorrow.

2. *Resolved*, That as a mark of respect to his memory the Commissioners' rooms, with the architect's office in the City-hall, be closed until after the interment, and that they be appropriately draped in mourning for thirty days.

3. *Resolved*, That the Commissioners in a body, with their officers and employés, attend the funeral services, to be held this day.

4. *Resolved*, That this minute and resolutions be published and a copy suitably engrossed be sent to the widow and family of the deceased.

On motion of Mahlon H. Dickinson, Esq., it was unanimously resolved that a suitable memorial be erected in the Public Buildings to perpetuate the name and services of John McArthur, Jr., the architect, and that a committee of three be appointed to whom the work shall be entrusted, and the president appointed, Messrs. Dickinson, Gaskill and Miller.

True extract from the minutes.

Attest. Samuel C. Perkins, *President.*

William B. Land, *Secretary.*

TRADE SURVEYS

So far as the leading architects of the country have expressed their opinions or anticipations as to business for 1890, they all lean very strongly to the opinion that building operations will exceed in magnitude those of 1889. This probability has been hinted at heretofore. Detailed reports have been received from twenty or thirty of the larger cities, and, without a notable exception, preparations are being made for great activity, not only in the construction of houses, but in the building of manufacturing establishments, banks, offices, educational institutions and churches, bridge work, elevated-railroad work, all kinds of municipal work, water and gas pipe laying, street-paving and a variety of work which cannot be briefly enumerated. At the same time, complaints are heard in many quarters of hard times, difficult collections, narrow margins and an increase in commercial failures. Those who give expression to the more hopeful views are regarded by many as speaking wildly, or without a proper knowledge of actual business conditions. It is true that commercial failures last year exceeded those of the previous year in number, and in the magnitude of the indebtedness; but when these facts are differentiated, it is ascertained that the increased failures and increased indebtedness was not out of proportion to former years. That there should be a gradual increase, under existing commercial and financial conditions, is to be expected. Thousands of incompetents are crowding the avenues of business, rushing into undertakings without sufficient knowledge or capital, and their failure is, therefore, only a question of time. The aggregate of results speaks for itself. The bald commercial facts stand out for themselves. Railway traffic is larger than ever; farmers and cotton-planters have made more money than ever. Railroad companies are making more money and doing less quarrelling. The volume of business, as it appears from clearing-house reports, was ten per cent greater last year than in 1888. The gross clearings were, in round figures, $56,000,000,000, as against $49,000,000,000 for 1888. Large corporations and concerns, it is true, have been squeezing out the smaller; but, if so, it was chiefly because the larger were better able to render the public good and cheap service. There is a disposition in many quarters now to predict disaster; to say that the trusts are insidiously undermining public confidence; that legislation is not able to protect the public interests as it should; that indebtedness is rapidly growing; that general insolvency is already a cloud the size of a man's hand in the sky, and that many other lugubrious indications warn the public of coming disturbances. The manufacturing interests have no time to pay much regard to these things; their order-books are full and their shops are busy.

Last week 10,000 to 12,000 tons of freight remained in Chicago storehouses for want of cars. Throughout the South cotton, pig-iron, lumber and other raw material are awaiting the arrival of cars. In the far West there is a reported shortage of rolling-stock. In very few instances, so far as reliable information goes to show, is there any accumulation of stock. There are no legislative measures threatening public security and confidence. The great political parties are differing only on minor questions. The banking interests express no fears as to their ability to see the business and commercial interests safely through. Speculation is threatening a little unsettling of values here and there, but taking the markets all through values are stable, production equal to demand and new markets are multiplying; the cotton goods manufacturers, in fact the manufacturers of all kinds of textile goods, do not find it necessary to restrict production. The absence of restriction and the necessity for it, excepting in isolated cases, is the strongest proof of a healthy industrial and commercial condition. Despite all talk to the contrary, the lumber manufacturers in all sections of the country are making preparations for a big winter's work. How long these favorable conditions may continue no one can foretell. The theory of alternate commercial chills and fevers is a barbarous one, and one which enlightened public opinion should not entertain. The industries in all foreign countries are in a preëminently satisfactory condition. Immigration is taxing the capacity of vessels. South American countries are filling up with new peoples. British and Continental ship-yards are busy. The iron and steel works and machine-shops of foreign countries are now crowded with work, the purpose of which is to enable people to move about and away from their old homes. Travel is the great industrial fulcrum; equalizing tendencies as to population are at work. Countries which were formerly months apart are now only days removed from each other. The cost of living is declining and the capacity for consumption is increasing. Raw material is being supplied in greatly increased quantities, as is shown by the increase in the production of iron ore, coal, lumber and petroleum. The masses are passing out of a condition of infancy and feebleness into manhood and activity. There is no natural or legitimate reason why the phenomenal activity of the past few years should be followed by a depression, and yet such a depression may come.

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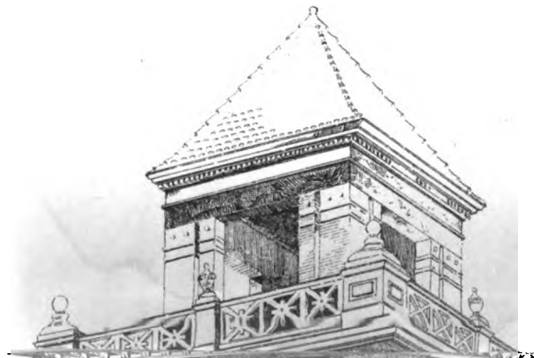

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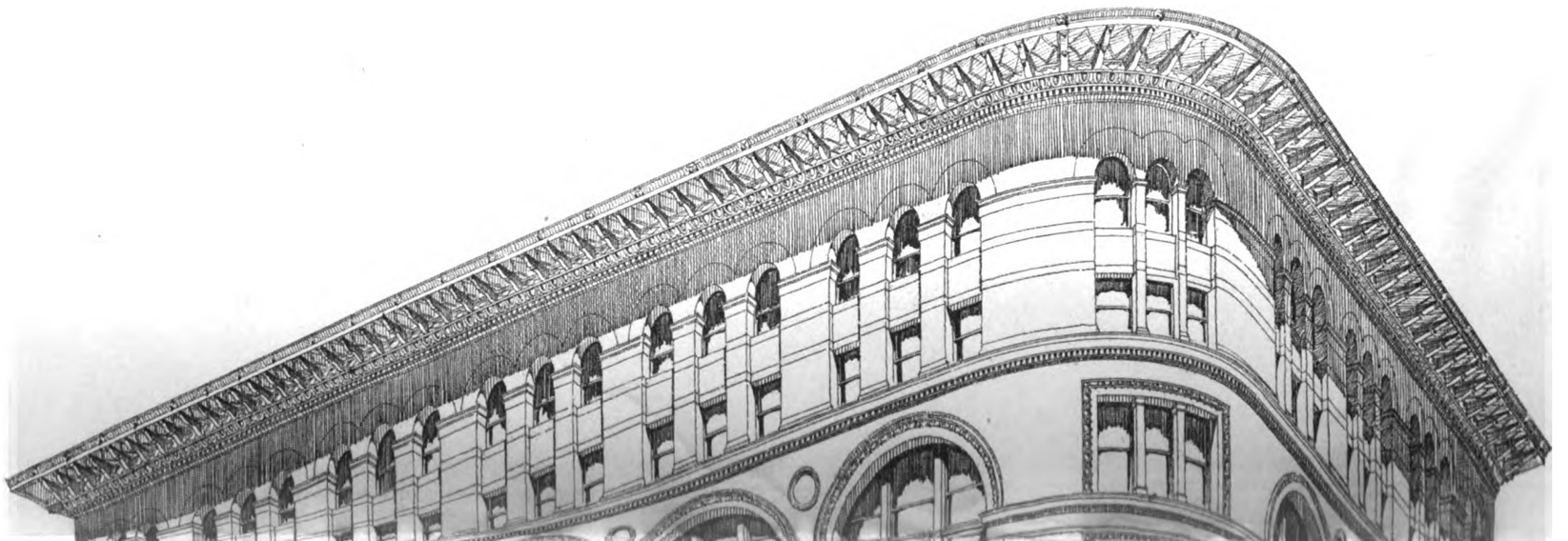

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House at Ruxton, Md.
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F. G. W. Dietrich, Architect.
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Sketch for Hotel at Norton, Va.

Geo. T. Pearson, Architect
427 Walnut St. Philad.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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EVERY one will be sorry to hear that Mr. Ruskin is now suffering from what is probably his last illness. It is some years since transient symptoms of disease of the brain made it necessary for him to give up a part of his work, and similar symptoms have from time to time recurred, with increasing violence. Now, however, as foreign advices inform us, a severe attack, not, perhaps, so acute as some of the previous ones, but acting on a body already enfeebled by the progress of the disease, has completely prostrated him, and his physicians can give no hope of his recovery. Erratic as his later course has been, Mr. Ruskin must always be regarded as one of the greatest, we are inclined to say, the greatest man of his time. It has been the fashion for several years past to decry him, to laugh at his political economy, and to speak of his influence as having vanished, but this does not alter the fact that forty years ago he was the intellectual leader of England, and of a large part of the population of this country. Through him was opened a way of thinking, not about painting and architecture merely, but about human duties and responsibility, which has left an ineffaceable impression on the English-speaking world; and few reading-men of middle age can forget the noble thoughts and purposes with which Mr. Ruskin's works inspired them in their youth. We should be glad, as a tribute to the greatness of one of the noblest souls that ever lived and suffered on this earth, if some of our younger readers would try for themselves the quality of the teacher who is now passing away from them. Let them read, if they can get it, the "*Two Paths*"; or, if this is not available, the "*King of the Golden River*," or the "*Ethics of the Dust*," followed by the "*Lamp of Memory*," in the "*Seven Lamps*," and as much of the "*Stones of Venice*" as they have time for, and all of the "*Modern Painters*" that they can understand. We do not say that they will find the safest architectural criticism in these books, but they will get a lesson in pure and noble morality that will last them the rest of their lives. Then, if they wish for something less inspiring, perhaps, but thoroughly practical, let them get the "*Elements of Drawing*" and "*Aratra Pentelici*," and keep them where they can look at them and practise from them constantly.

THE *Spectator*, which may be supposed to reflect the sentiments of insurance men pretty accurately, has something to say about the relations of underwriters to building which curiously, though unintentionally, confirms what we have often maintained, that if underwriters chose, they could revolutionize the present system of building; and that the main reason why they do not do so is that the companies are afraid of losing city customers if they show themselves strict in adapting rates to actual risk, and they consequently wink at cheap and dangerous methods of construction, and protect themselves against the almost certain losses which these will cause them by charging unreasonably high rates upon good risks. For these reasons we think, as do a good many other people, that the present practice of underwriting encourages bad building; and when the insurance magnates, after a serious fire, declaim against architects, as being persons devoid of skill or conscience in the construction of buildings, the latter are quite justified in calling attention to the hypocrisy and injustice which extol the man who builds solidly, and condemn him who erects fire-traps, at the same time that they demand enormous premium rates from the former, for the avowed purpose of being able to sell a policy to the latter for a price which, as they confess, does not pay for the risk. "There is no particular reason," the *Spectator* says, "why underwriters should assume all these duties [of seeing that new buildings are well constructed, and so on] any more than any other class of citizens, but when nobody else is found upon whom to shoulder the responsibility, the tendency is to shove it on to the underwriters." "As a matter of fact," it continues, "they are not interested in building construction, in fire-protection or fire-prevention to any greater extent than are other property-owners. *It is their business to insure property as they find it, and at rates proportionate to the hazards to which it is exposed.*" We italicize this last clause, which contains the whole matter in a nutshell. If the underwriters would do what the *Spectator* here says it is their business to do, construction would be reformed at once, and it is exactly because they do not do this that it is not reformed, and that conscientious policy-holders are openly plundered, to enable the insurance companies to retain the patronage of the reckless cheats who degrade the art of building with their cheap shams, and are supported and abetted by the underwriters in doing so. Three lines below the exposition of what it is "the business of the underwriters" to do, the *Spectator* tells us that they actually do, whatever their business may be. "The trouble is," it informs us, "that they do not charge adequate rates because of the great competition for business existing among them," and, a little farther on, speaking of insurance methods in New York, it says: "As a rule, the companies lose money on the metropolitan business." "They go on paying out more money for the privilege of doing this business than it brings in, and *depending upon the rest of the country to make up the deficiency.*" A more explicit acknowledgment of the fact that the underwriters directly encourage bad building by subsidizing it at the expense of people who build securely, it would be difficult to make, and, as the concern of most persons is with insurance as it is practised, not as it ought to be, we shall continue to believe, until the companies carry out their own alleged maxim of insuring all property "at rates proportionate to the hazards to which it is exposed," that they are the principal agents in promoting the very methods of construction against which they preach so loudly.

THE same paper furnishes us this week with another illustration of the fact that building construction is controlled almost entirely by the insurance companies. Speaking of the Boston fire, it deplores the fact that so few buildings in the Eastern cities are protected by stand-pipes. It describes the stand-pipes which, as it says, are in general use in Chicago, by which a three and one-half inch pipe is attached to the outside of the building, near a vertical row of windows, having a "Siamese" connection at the bottom, to which the hose from an engine can be coupled, and an opening in each story, near the window and on the roof, to which a hose can be attached, and a stream of water thrown from this point directly into the window, without the loss which results from friction, and the dissipation of the stream, where water is thrown from an engine on the ground. It seems to have forgotten that ten years or so ago such stand-pipes were put on nearly all the new buildings

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in New York. The insurance companies, or rather, the Underwriters' Association, made a discount from the regular premium rates on buildings and goods where they were used, and, although the reduction was a small one, it amounted to more than the interest on the cost of the equipment of pipes in most cases, and owners of new buildings put them on as a matter-of-course. After this rule had been in force a few years, the Underwriters' Association met, and, among other things, voted to discontinue the reduction from regular rates allowed for stand-pipes; and we venture to say that not a dozen stand-pipes have been put up on buildings in New York since. Nearly all architects, those ignorant and reckless beings who come in for so large a share of underwriters' maledictions, know all about stand-pipes, how they ought to be put up and used, but they know also that the owners of their buildings simply laugh at them when they convey to them warning and suggestions, either inspired by travelling insurance inspectors, or deduced from their own experience, with which a modification of premium rates is not connected.

THE *Engineering and Building Record* gives an account of the arrangement and administration of Messrs. Burnham & Root's great office in Chicago, which is not only interesting, but contains some very valuable hints for all architects. Reference should be made for full particulars and for a plan of the office to the article itself, which appears in the issue of the *Engineering and Building Record* for January 11, but it may be permitted us to comment upon some points. As with most architects who carry on a large business, the arrangement of the office is such as to subdivide the space into a number of compartments, nine in this case, each of which is occupied by two or more draughtsmen, as the case may be, who are thus isolated to a certain extent from the others, and from the bustle and traffic of the main office, experience showing that more and better work is done in this way in a given space of time than under the old system of having all the work done in one large room. Besides the compartments for draughtsmen, each partner has his private room, and there are separate apartments for the chief engineer, the book-keepers, the superintendent and the librarian; the library forming also the public reception-room. There are also several storage-vaults, a stock-room with table for cutting paper, a contractors' reception-room, a printing-room, a lavatory, with bath-room, and gymnasium. The last is a rather novel appendage to an architect's office, but experience has shown that the men work better and more efficiently if they are encouraged to take recreation in physical exercise during their spare moments. In the same way, the bath-room has been found to be perceptibly beneficial in increasing what we may call the output of the office. With true business prudence, fireproof vaults are provided for all drawings and records, and before the office is closed at night, even the drawings on the boards, as well as every letter or paper relating to the business of the firm, is locked up out of reach of fire or smoke. Next to the partners, the management of the office is in the hands of an official known as the chief engineer, who takes the sketches and instructions from the hands of his principals, and sees to the proper development of them into working-drawings. This gentleman is really a highly-trained engineer, but he is assisted by a consulting engineer, Mr. Strobel, of the Keystone Bridge Company, one of the most skilful constructors in iron in the country, and by a sanitary engineer who spends four days in each week in preparing the drawings and specifications for the drainage, heating and ventilation of the buildings designed in the office. It may be imagined that in an office so large and so systematically arranged, a good deal of space is devoted to book-keeping, and a special room, with desks for head-book-keeper, clerks and type-writers, is provided near the entrance. Besides these, there is a large room for the accommodation of the superintendents and clerks-of-works, who are employed on all large buildings designed by the firm. These clerks-of-works, although paid by their clients, are appointed by the firm, and are usually skilled engineers, who have had positions in the office. Besides the clerks-of-works, however, the firm itself employs a large force of superintendents, who travel from Maine to California in the firm's interest, reporting regularly to the chief engineer and sending photographs of buildings in various stages of erection. Large as is the force employed, the draughtsmen sometimes numbering sixty, in addition to the host of clerks, book-keepers and superintendents, a great deal of labor, particularly of cheap draughtsmen and tracing-boys, is saved by a most admirable invention of the present chief engineer, Mr. Ewen. Finding that the cost of making tracings was, in the aggregate, very large, and that the work of the tracing-clerks needed a great deal of supervision to prevent disastrous mistakes, Mr. Ewen utilized the blue-printing room attached to the office for setting up an enormous hektograph apparatus, capable of taking in a large drawing. He then had colors prepared with aniline, in such a way that all the coloring and inking-in, lettering and figuring of the drawings could be done with them, and now all the drawings intended to be duplicated, which, of course, includes nearly all the drawings made in the office, are inked-in, figured and colored with the aniline pigments, and are then transferred to the hektograph slab, and as many copies as may be needed are taken off, all in the exact colors of the original, and reproducing every line, dot and shade. The value of this ingenious invention to architects engaged in important work can be best appreciated by those who have had most experience of the stupidity and carelessness of tracing-boys, and who have had to foot the bills incurred through their mistakes. It may be imagined that an office like this is not carried on for nothing, notwithstanding the elimination of the costly and unsatisfactory tracing-clerks. We have been told that Messrs. Burnham and Root pay their chief engineer a salary of six thousand dollars a year, and as it is their uniform policy to employ only the best assistance, no matter what it costs, their expenses, when the office is full, are probably at the rate of more than a hundred thousand dollars a year.

A VERY novel device has just been put in operation in the cars of the District Underground Railway in London. The line runs mostly underground, and the cars are dark and cheerless by day as well as by night. In this country they would be made so bright and cheerful as to invite instead of repelling passengers, but such things are managed differently abroad, especially where there is no competition. However, in railway matters, what is one company's neglect is another company's opportunity, and a scheme has been perfected by which a box, open in front, is placed behind each passenger's head. The box is provided with a slot, and, on dropping a penny into this slot, a bright light immediately issues from the box, in a convenient position for illuminating a newspaper held in the passenger's hands, and continues to shine for a quarter of an hour. At the expiration of that period it is extinguished, but can be immediately relighted for another quarter of an hour by dropping another penny into the slot. As the light is placed far back in the box, it will shine only on the newspaper of the person who pays for it, and, as the District trains are usually crowded at all hours of the day, with twenty-four passengers in each car, all, probably, interested in newspapers, the income of the company owning the light-boxes must be very considerable. The mechanism of the boxes is tolerably complicated; besides the apparatus for switching on the electric-light on the dropping of the penny, each box contains clockwork, which is set in motion as the penny drops, runs for fifteen minutes, and then switches off the current, and, as this may be repeated forty times a day, the duty of winding up all the boxes must be a heavy one.

FOR the Achille Leclère prize this year in Paris, the programme announced is a rather startling one, the competitors having, as Mr. Pecksniff would say, to exhibit their "ideas" of an arena for bull-fights. What Mr. Henry Bergh would have said to such a barefaced attempt to corrupt the minds of young architects by inducing them to fix their imagination on so horrible a topic, we cannot imagine, but Paris seems to have, as yet, no zealous defender of the feelings of brutes, and the programme, with all its shocking details, has been published without protest. The structure is to be situated "not far from the fashionable quarter," and is to be furnished with all the paraphernalia of the bull-ring, including the wooden fence over which the picadors vault when the bull gets too near them, boxes for the "authorities," "bars and buffets" and so on; and among the "dépendances" are to be stalls for ten bulls, and accommodations for thirty horses, including boxes for wounded animals. In addition to all these comforts for the quadrupeds, a peculiarly Parisian one is specified for the bipeds, in the shape of a foyer, where "the privileged public" can have the inestimable happiness of conversing with the matadors and stable-men.

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CIVIL AND DOMESTIC ARCHITECTURE.[1] — III.

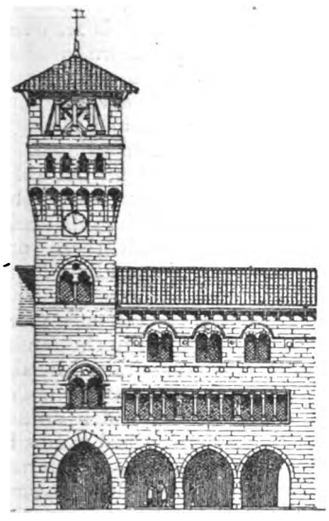


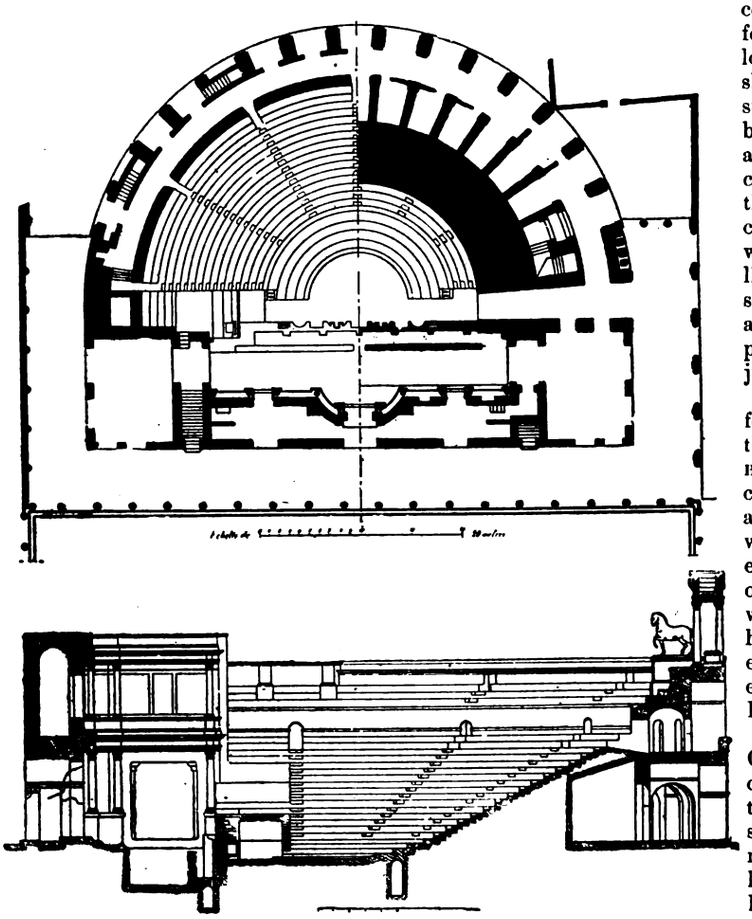
Fig. 12. Hôtel de Ville at Saint-Antonin.

THE Romans were likewise fond of theatrical representations. These were at first simple dances, but they were later transformed into mimes and comedies. They formed a part of all festivals, and were primitively enacted on movable stages. It was Pompey who founded the first stone theatre at Rome.

The Roman theatre, like the Greek, included semi-circular rows of seats for the spectators, an orchestra and a stage. But as theatrical performances at Rome did not, as in Greece, possess a religious character, there was no call for the altar to Bacchus nor for the space around the altar reserved for the execution of the sacred hymn. The orchestra became, therefore, merely a section appropriated to the aristocracy. The stage, on the contrary, was enlarged. As for the seats, they were not cut in the flank of a hill, but were supported on vaulted substructures; the vaults formed galleries and passages. The exterior of the theatres showed one or several series of arches, with pilasters or columns, and surmounted by an attic story. Remains of theatres are found wherever Roman civilization pushed its way.

The Romans, however, took still more pleasure in chariot-races and horse-races than in theatrical performances. These races were the predominant sports of the circuses, though combats of gladiators and of wild beasts were joined to them. The Circus Maximus, which occupied the space between the Aventine and Palatine hills, was at first laid out in a very elementary fashion, but it was completely remodelled in the time of Cæsar and under the emperors.

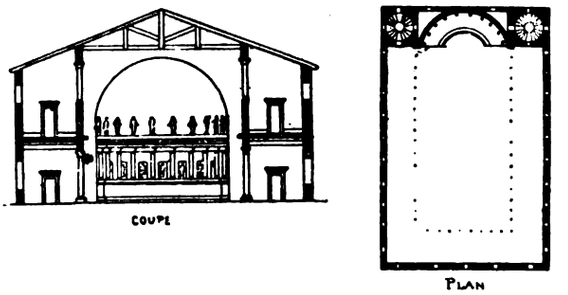
There were about fifteen of these constructions at Rome and in the vicinity. They were in the form of an oblong parallelogram, terminating at one extremity in a semi-circle, and at the other in an oblique and slightly concave building, in which, on the ground-floor, were the chariot-houses, and above these the galleries of honor and the musicians' stand. The arena, which was marked off by a canal filled with water, was divided through its longest axis into two sections by a broad wall (*spina*), raised breast-high, and terminating at each end by three goals called *metæ*.



Figs. 8 and 9. Plan and Section of the Theatre of Herculaneum.

Around the arena there were seats supported on porticos.

The amphitheatres were more especially designed for the combats of gladiators and of wild beasts. They comprised two principal parts, the arena and the spectators' seats, which were ranged in retreating rows one above the other. The wild beasts were kept under the lower line of seats, around the arena. The Romans took great pleasure in these bloody contests which became, as it were, a State institution. They erected great numbers of amphitheatres in the provinces, as well as in Rome. The largest of all these was the Colosseum of Rome, a remarkable structure of elliptical form, which could never have been built except under an architectural system like that of the Romans. They displayed an extraordinary degree of skill and practical sense in the execution of this stupendous work.



Figs. 10 and 11. Section and Plan of a Roman Basilica.

We must not infer, however, that games had from earliest times occupied the highest place in the thoughts of the Roman people. The forums, or public squares, where this same people assemble as the Greeks assembled in the agora, for their elections and for the discussion of State affairs, prove the contrary. Sometimes the forum was enclosed by long porticos and rows of shops, sometimes it was surrounded by temples, basilicas and triumphal arches; prisons and the curia were also found there. All the public life centred in these squares, which were generally quite limited in area, and which served at the same time as markets, assembling places and places where justice was dispensed.

All these matters were for a long time treated in the open air. Cato (185 B. C.) was the first to conceive the idea of erecting a structure in the forum which should be open to every one. This was the origin of the basilica, which was at once a court-house and a stock-exchange. There were eighteen basilicas at Rome.

Later, the primitive Christians modelled their churches after the plan of the basilica. It was very simple in design, being merely a large rectangular hall divided in its longest direction by two rows of pillars, thus forming three naves. At the extremity of the central nave, which was broader than the other two, the wall curved in a hemicycle. It was in this recess that the sittings of the court were held (Figs. 10, 11).

We have spoken of the triumphal arches which were erected in the forums. The Romans were the first, except perhaps the Chinese, to rear monuments of this kind. When a victorious general made his entry into Rome at the head of the triumphal procession, the wildest enthusiasm must have prevailed among the people. All along the route which he was to traverse in order to reach the Capitol, leafy bowers were raised, with

[1] From the French of G. Guicestre, in "*Encyclopédie de l'Architecture et de la Construction.*" Continued from No. 734, page 37.

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garlands and streamers. These temporary decorations were long the only ones in use in the celebration of victories. In time it became the custom to honor the conqueror by setting up at the entrance to the cities huge wooden gates adorned with the trophies and spoils of conquest. Finally, under the Empire, stone, marble and bronze began to take the place of wood in these constructions. The simplest triumphal arches consisted of a single opening, the arch being semicircular [the Arch of Titus at Rome, the Arch of Saint Remy in France]. There were others with two arches [those of Verona, Langres and Saintes]. Others still were made with three openings, the two lateral ones being usually smaller than the central one [Arch of Constantine, Arch at Orange]. The arches were accompanied by columns raised on pedestals and surmounted by an attic. Wherever the Romans penetrated, these structures, reared in memory of their conquests, are to be found.

They made use of isolated columns to commemorate remarkable events, to mark important spots, and to honor their distinguished men. The column of Duilius at Rome, the oldest one of the kind, was erected after the first naval triumph over the Carthaginians (260 B. C.). The shaft was decorated with beaks of ships. Under Augustus columns were also reared to celebrate the victory won at Actium. But the most beautiful and the best known example of these monuments is that raised in honor of Trajan's defeat of the Dacians.

We will pass over the Roman tombs, monuments designed to perpetuate the memory of the dead. Enough has already been said to show the extent and variety of Roman architecture. The political organization of this eminently practical people was such that they attached especial importance to works which the more art-loving Greeks had neglected. Roman civil architecture, which always bore the imprint of grandeur, invariably responded to the utilitarian demands of the times.

In the East, after the transfer of the seat of the Empire to Byzantium, the erection of civil edifices continued as before. The emperor Constantine was anxious that the new capital should rival Rome in grandeur and magnificence. Great roads were constructed; palaces, triumphal arches and public baths sprang up on all sides; a forum was laid out; porticos, a circus and a hippodrome were built. Though different forms were introduced, the essential features of the structures did not differ from those of the Romans. The fresh impulse given to architectural activity by Constantine was strengthened by his successors, especially by Justinian, who sprinkled the cities of the Empire with monuments of all kinds. With the eleventh century, however, there came a decline. Already Roman rule in the East was threatened with ruin. The successive hostile invasions to which it was subjected, necessarily led to a neglect of the arts. At length, in 1453, Mohammed II entered Constantinople and established there the throne of the Ottoman Empire. Mussulman architecture then superseded the Byzantine.

The Mussulmans had already bestowed much attention on certain structures which are to be found to-day, by the side of the mosques and minarets, in all countries subjected to Islamite rule; whether these people be Africans or Hindoos, Persians, Arabs or Turks, these buildings have to minister to the same religious needs, and to meet the demands of domestic, commercial and public life.

These are, first, bathing-establishments, in the construction of which the general arrangement of the ancient thermæ was preserved; then fountains (*sebil*) and public watering-places (*hod*), built on a semi-circular or polygonal design, with a dome-shaped covering. Usually these have an upper story, where a primary school is kept: the colleges were largely attached to religious edifices. Cisterns, too, are of great importance in Moslem towns; the vault of the subterranean portion almost always rests on a large number of columns. Then there are hospitals, the rooms of which are disposed around a court adorned with porticos and *okels*, or immense constructions designed for commercial purposes. These, as is the case with most public edifices in Asia, exhibit a vast court encircled by porticos; in the rear of the columns are the vaulted storehouses and the shops, the latter surmounted by a pent-house. The story above contains rooms with balconies, the apartments where the merchants sleep. A fountain and a small oratory occupy the centre of the court. There are also caravansaries, or *khans*, a species of inn situated either within the cities or along the great caravan routes. Their general design differs but little from that adopted for the hospitals and *okels:* there is invariably a court surrounded by halls.

The Mussulmans' houses consist of two distinct parts, each part built around a court, as in the Roman and Greek houses; the first section, the *selamlik*, is used for the reception of strangers and for guests; the other part, the *harem*, is reserved for the family; in both the apartments are more or less numerous, more or less important, according to the rank and means of the proprietor. The walls are usually covered with colored faience, the floors are paved with marble, and the ceilings are vaulted or flat, with the joists exposed and painted.

The palaces have the same general arrangement, but they are built in a more costly style, with halls surrounded by colonnades and decorated with marble basins, with gilded ceilings and slender galleries, and, connected with them, are gardens, baths, a library, kiosks, aviaries and sparkling fountains.

If, quitting the Orient, we retrace our steps and once more enter ancient Gaul, we shall find that even down to the feudal period the inhabitants made use of the structures raised by the Romans. Before the Roman Conquest, with the exception of religious monuments [Druidic or Celtic stones] which do not concern us, there was nothing but huts and fortified camps in the country. So long as the customs of the conquerors obtained, no essential changes in architectural design were demanded. The private dwellings differed but little from the Roman villas. They were nearly always simple buildings arranged around two courts. It was not until the time of Charlemagne that the seigneurial villa became transformed into a strong castle, and it was only after the great movement of the communes in the eleventh and twelfth centuries that civil edifices began to be erected in the cities. Until that time the only monuments were churches, fortresses and walls of defence.

When the first concessions of public rights were made, the cities built for themselves a common house or town-hall, a *hôtel de ville* in which they could discuss their affairs; a belfry was always included in the design. But these communes experienced so many vicissitudes that there remain but few city-halls of earlier date than the fourteenth century. The only one standing in France belonging to the twelfth century is that of Saint Antonin (Tarn-et-Garonne, Fig. 12.) The cities of the South, like those of the North, of Flanders and Brabant, knew how to guard their franchises, while those included in the domain of the crown were not able to erect any municipal edifice before the fifteenth century.

The town-hall generally stood in the public square. It comprised, on the ground-floor, open porticos, used as public markets, and, above, a large hall, which served as an assembling room; the belfry-tower rose in the centre of the façade. These belfries were at first isolated; they contained the alarm-bells, which announced afar all franchises won. Compiègne, Arras, Béthune, Bergues, Auxerre, Beaume, Évreux and some other French cities still possess their belfries, either isolated structures or an appendage of the town-halls.

Exchanges and markets were also built, as well as great numbers of hospitals. The founding of hospitals dates from the establishment of Christianity. These new institutions introduced architectural needs unknown to the ancients. True, it may be urged that there were annexes to certain temples of Æsculapius whose purposes were not unlike those of hospitals; they were designed for the care of the sick and of women in childbirth, but they were of only rare occurrence. It was the Christian sentiment which led to the opening in the East, from the third century, of places of refuge for the sick and for travellers. It was this same sentiment that caused such houses to be attached to the convents during the Middle Ages, and that roused the cities to imitate the clergy. The Hôtel Dieu, at Lyons, goes back to the days of Childebert (542), and the one at Paris was founded by St. Landry about 660. Charlemagne, Philip Augustus, and St. Louis set the example of benevolence; public and private charity followed in their steps; but the inroads of leprosy, a disease brought back from the Crusades, necessitated a considerable increase in the number of hospitals. There were two thousand leprosy hospitals (*lèproseries, ladreries* or *maladreries*) in France under Louis VIII. There were also asylums for the insane and for the indigent and aged; there were lying-in hospitals, and in 1254 St. Louis established an asylum for the blind in Paris, the hospice of *Quinze Vingts*.

The rooms in the hospitals, which were always vaulted, were often divided into two or more naves by one or several rows of columns. They were high and airy, with a vestibule at one

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extremity and a chapel at the other. In the wings were the cells of the monks and nuns, a medicine laboratory, a refectory and a kitchen. Wherever it was possible, there were gardens connected with these institutions.

Cemeteries surrounded by enclosures with porticos, like that of the Holy Innocents at Paris, and of Saint Denis at Amiens, were also laid out: at first they were located about the churches, within which distinguished persons were interred; later, when the increase of epidemics had rendered such burial-places not only inadequate but dangerous, they were placed *extra muros*.

The establishment of exchanges, dates really from the twelfth century. However, an exchange encircled by trenches already existed in Paris in the eleventh century. In 1183, Philip Augustus had two others constructed in the same capital. The merchants could sell their goods there in safety, protected, as they were, by stone walls closed by gates; there was even a sort of shed-like gallery which enabled them to continue their business during storms. Saint Louis built several other exchanges, two of which were for the sale of cloths. These edifices were like huge barns. They were, naturally, enlarged and modified in various ways to meet the demands of the times. Scarcely anything but débris remains of them to-day, and this only in cities of inferior rank.

While provision was thus carefully made to guard the commercial interests of the country, letters, the arts and sciences were not neglected; learning was at first fostered in the monasteries. Saint Louis founded a large number of colleges, among others the Sorbonne, and he opened several public schools. The work begun by him was carried forward by his successors. The Law School was built in 1415, and the School of Medicine in 1472.

During the Middle Ages fountains were also considered of prime importance. They were constructed not only in the cities, but along the highways. Examples of the latter are to be found to-day in Brittany, in Poitou and in Normandy. The spring of water was usually covered by an arch of masonry, and benches were placed on either side of the basin for the comfort of travellers. In the cities the fountains were generally on the squares or *carrefours;* the water was carried through several pipes and fell into a large basin. Fountains of this kind still exist in a more or less perfect state of preservation in Brou, Provins and Rouen. The earliest public fountains of Paris were erected under Philip Augustus.

As for bridges, the people of the Gallic provinces long made use of those thrown across their rivers by the Romans. These were gradually destroyed during the wars, and others were built, doubtless of wood. There are no remains of stone bridges dating earlier than the twelfth century, but from that period large numbers were constructed. A corporation even was formed called the *frères des ponts*, or *frères pontifes*, whose members devoted themselves to bridge-building. These bridges, which were narrow and defended by castellets or fortresses, showed a series of pointed or semi-circular arches diminishing in diameter from the centre toward the banks. The piers were set with an angle to the current.

The famous bridge at Avignon was built in the twelfth century (1177). The one at Orléans had a castellet on the city side, a bastile dedicated to Saint Anthony in the centre, while at the other extremity rose the turreted stronghold, the *fort des tourelles*. The ancient bridge at Rouen, like the bridges at Vernon, Pont-de-l'Arche and Cahors, was fortified in the same way. In Paris the bridges have suffered numberless vicissitudes; moreover, most of them were originally of wood with houses built along them. The oldest were the Pont au Change and the Petit Pont, each having a bastile (*le grand et le petit châtelet*). The Pont Nôtre Dame and Pont Saint Michel may also be mentioned.

The cities of the Middle Ages were protected by walls flanked with towers and pierced by several gates. They were usually situated on rivers, the banks of which were connected by fortified bridges. On the side opposite the city, houses were gradually grouped around the defences, thus forming the faubourgs.

In the interior of the cities a surprising number of churches were to be seen, and also a cathedral that was always readily distinguished from the other houses of worship. Then there were walled monasteries occupying immense tracts of land and the dwellings of the higher clergy. But, facing the strongholds of the spiritual power, and representing the temporal, stood the castle, erected either on an eminence or on the bank of the stream. Later, a third power, springing from the enfranchisement of the communes, manifested itself. It entrenched itself in the hôtel de ville, which lifted its belfry in defiance of the towers of the cathedral and the donjons of the castle. The dwellings of the different classes of citizens clustered around the bulwarks of these three powers.

The houses opened on the streets, and not on interior courts, as was the case with the ancient Greek and Roman dwellings and with more modern Oriental edifices. They included a family-room on the ground-floor and other apartments in the stories above. If the proprietor was a craftsman his shop was on the lower floor, and the common room was relegated to the second story, where it was used not only for social intercourse, but for other purposes. The shop was lighted by a large opening, and was entered through a side-door several steps up from the street. The large room above had one continuous window, which was divided by columns into several compartments. These houses were constructed partly of stone and partly of wood. Wholly wooden ones are not found in any considerable number before the thirteenth century, and then they were chiefly in the North. The gable-end of the dwelling was toward the street, and the roofs were high and projecting. In the South, a great number of new cities were built up at one stroke and on a regular plan; they were walled, and were termed *bastides*.

[To be continued.]

THE ART OF THE VIKINGS.[1] — II.

Fig. 1291.—Bracteate with runic alphabet. — Vadstena, Sweden. Real size.

THE Vikings carried the art of working in gold and silver to a high degree of perfection. The use made of these metals in decorating objects of bronze and iron has already been mentioned, and they were not less skilful in executing articles composed of them exclusively. Sometimes the gold or silver is plated on another metal, as gold on silver, or silver on bronze; sometimes the object is without any alloy at all, but is nearly pure. Both niello and filigree work were used, and a favorite style of decoration was with garnets *enchassés*. All sorts of jewelry were made, such as any lady or gentleman of rank might be supposed to need. There were buckles, bracelets, rings, necklaces, beads, diadems, fibulæ, charms, ear-rings and many other objects of use and beauty. All were fashioned with great skill, and presented a remarkable variety of design. Spiral bracelets seem to have been fashionable, judging from the large number found, but other forms were used as well. Numerous fibulæ have been preserved to the present day. They were used to fasten the ends of the cloak together onto the right shoulder. They present an almost endless variety of shapes, from a simple pin to a large and costly ornament. A very elaborate one is of silver-gilt, and in shape not unlike a cross with a base, the whole turned upside down. It is highly ornamented with a geometric design; the most elevated flat parts are *neilles*, and there are many blue stones scattered all over the surface, some of them fastened with gold.

Bracteates are another form of ornament that have been found in large quantities. They are of gold, and seem to have been worn hanging from the neck, and were probably looked upon as protective amulets, or they may have been used by the priests in religious ceremonies. They were circular in form, and resembled large medals or coins with a loop attached, through which a cord or chain could be passed on which to suspend them. A general system of ornamentation was followed, consisting of concentric circles with geometrical designs, the innermost space filled with some symbol or mystic sign. The symbolic signs were never absent, though what may have been their meaning is in no case understood. Explanations have, indeed, been put forth at various times, but the best of them are not more than conjectures, and are, therefore, wanting in certainty. No uniformity is to be found in these symbols: sometimes their form is geometric; at others human heads and strange animals are represented. The geometrical designs included the cross with four arms of equal length, the *svastika*, or hooked cross, in various forms, the *triskele*, or three-armed cross, the triad in the form of three dots, and the letter "S." All of these unquestionably had their special significance, now long lost. The decoration of human forms varied considerably, and, like the geometrical designs, undoubtedly had a peculiar meaning, which has also been lost in the course of ages. Sometimes a human head only is represented, at others it was in conjunction with a strange beast, while again a whole scene is enacted. Thus, on a bracteate found at Gudbrandsdal, Norway, a warrior is depicted fighting a dragon. Sometimes animals alone were represented, while a union of all three systems of symbols seems to have been frequent. A beautiful bracteate from Lyngly, Jutland, shows in the

[1] "*The Viking Age*" by Paul B. du Chaillu. New York: Charles Scribner's Sons. 1889. 2 Vols. 8vo. $7.50. Continued from No. 734, page 40.

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centre a man with a two-horned animal surrounded by the *svasitka*, the *triskele* and four dots forming a cross. The remaining surface is filled with three concentric rows of ornament, that nearest the centre being a conventional design, the next a circle of men's heads, and the outer row a circle of animals. A very remarkable bracteate was found near the small town of Vadstend, in Sweden, which contains, in the border, a Runic inscription, comprising, with the exception of the first division of eight, the earliest form of the Runic alphabet, all the letters save D being present. It frequently happened that the outer circles of ornaments were omitted from the bracteate, the entire surface being occupied by the symbols. These were usually small ones. When the reverse of the bracteate was ornamented it was with a different design from that on the obverse.

The subject of working in gold cannot be dismissed without reference to two golden horns found at Mogeltonder, in Jutland, in the seventeenth century, but which were stolen in 1802 from the Museum of Modern Antiquities in Copenhagen, and melted down by the thief. Even the casts have been lost, and only drawings remain to show what splendid works the Vikings were capable of producing. One of these horns was perfect, and measured 2 feet, 9 inches in length, and weighed over seven pounds; of the other only a fragment was recovered, but it is estimated to have been over 20 inches long. Both were ornamented with rings covered with scenes in *repoussé*-work, which included both men and animals. They unquestionably told some story, but no satisfactory attempt has yet been made to unravel it.

No description of the products of Viking art can be considered as at all complete that does not include some consideration of the runes and rock-tracings. Runic inscriptions do not, indeed, belong properly to the subject of art-history, but they are of interest as showing the skill employed in cutting them on the rocks, and because they are sometimes to be found with drawings of human and animal forms. These last are, however, rare and unimportant, being chiefly in outline. Rock-tracings are of considerable importance. These are rude, rough carvings in the rock of the outlines of various objects, men, vessels, weapons, etc., and in their general style and appearance closely resemble the rock-tracings of the North American Indians. Unfortunately, like many other Viking productions, their origin and purpose are unknown, and as yet no definite clue has been found as to their real intention. These tracings frequently cover large surfaces, and are to be found in all parts of Sweden and Norway. Sometimes actual scenes, as groups of warriors on horseback, are represented; at others the various figures are thrown together in an apparently unintelligible arrangement. All sorts of animals are introduced, including a number belonging to the South, as ostriches and camels, showing that the makers of these strange designs must at one time have been in active intercourse with the South. Ships and boats of various kinds are of frequent occurrence in the rock-tracings, and, in fact, they furnish the most valuable information as to the progress of naval architecture in the North.

Mention should also be made of the cloths and stuffs used by the Vikings. We have already seen that gorgeous and costly materials were used for the sails of vessels and in decorating the great halls. The ravages of time have not permitted more than the veriest fragments of the actual materials used in clothing to come down to us, but such as have survived show many elaborate designs. The ancient writings tell marvellous tales of the gay raiment with which

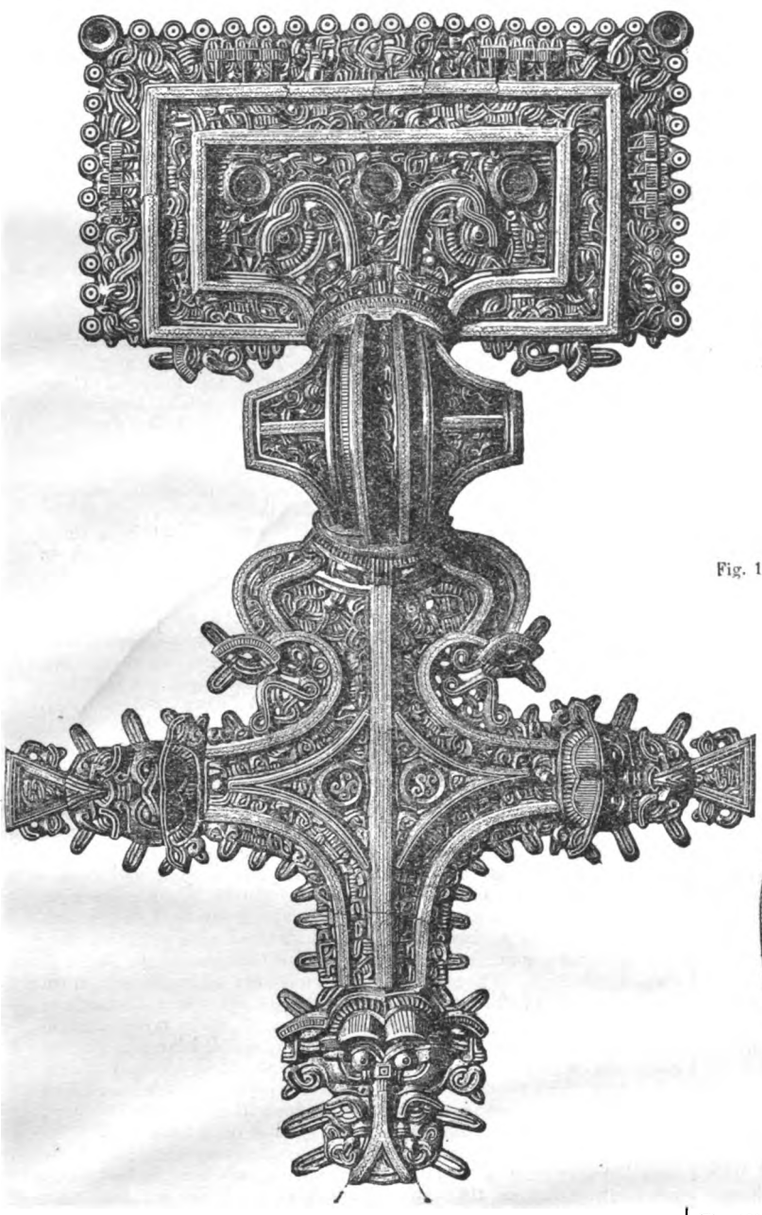

Fig. 1246.—Fibula of silver gilt. The most elevated flat parts are niellés. There are many blue stones here and there, some fastened with gold. ½ size. Found in a mound, with three gold bracteates, a spiral ring of gold, three small fibulæ of silver gilt of the same type, a bronze key, pieces of a two-edged sword, a small spear-head, &c., &c., unburnt bones and teeth of a cow and other animals, &c., and a quantity of burnt grain (rye).

Fig. 1295.—Bracteate found at Raflunda, Scania. Triangle of heads. Real size.

Fig. 1292.—Bracteate, Lyngby, Jutland, representing a man with a two-horned animal, surrounded by the *svastika*, the *triskele*, and four dots forming a cross, a circle of men's heads, and a circle of animals. Real size.

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the gentry were wont to bedeck themselves, and there is every reason to believe that the luxury to be found in other parts of the Viking existence was reflected in the dresses of the men and women.

Embroidery was a common occupation of the women of a household, and, though the Bayeux tapestry belongs to a later time than what may conveniently be termed the "Viking Age," it is probably not widely different from that made by the Viking lady and her maids.

The Vikings, however, were not always satisfied with the products of their own artistic toil, but brought objects of beauty and utility from other climes. Roman coins are common among the "finds," and specimens of both Greek and Roman work are of frequent occurrence. These objects included almost every imaginable article, and were probably the fruits of some expedition to the South. It is an interesting fact that the Viking artificers were apparently able themselves to produce everything needful not only for ordinary existence, but for occasions of state as well. They, at least, made almost everything in an unmistakably Northern manner, and they were, apparently, not dependent on the South for any object of household or personal use. Glass they did, indeed, seem unable to make, but glass objects of Roman manufacture have been found in various places, showing that they were not unacquainted with its use.

It would be going too far to characterize the Viking life as an artistic one; on the contrary, it was rough and rugged, and the men were more intent on accumulating wealth by their voyages than on the adornment of their homes or their persons. Yet, notwithstanding

½ real size.

Fig. 513.—Golden horn discovered at Mögeltönder, 1639, with thirteen broad rings round it. Length, 2 feet 9 inches; weight over 7 lbs.

½ real size.

Fig. 514.—Golden horn discovered at Mögeltönder, 1734. The exact length of this horn, which had round its broadest end an inscription in earlier runes, has not been stated, but, judging from a *facsimile* in silver gilt made by command of Frederick VII. from the old drawing, and presented by him to the old Northern Museum, it must have been over 20 inches long. Though the lower part was broken off and lost, it still weighed more than 8 lbs.

Fig. 293. — Red quartz stone, with earlier runes and warrior on horseback. Height, 8 feet 3 inches, but only 6 feet above ground; greatest breadth, 5 feet. —Hagby, Upland.

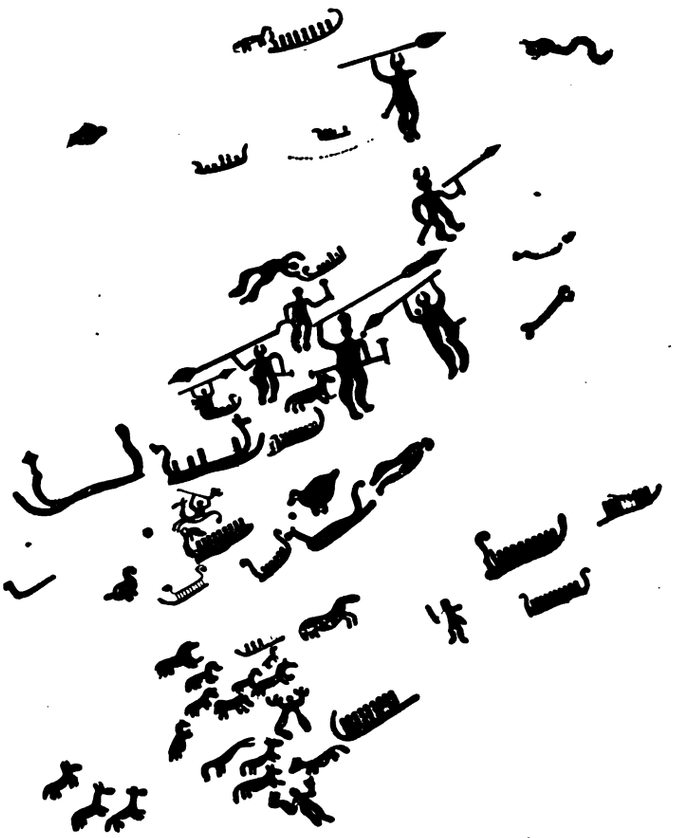

Fig. 895. — Rock-tracing — men fighting with spears; a man apparently lying dead in front of a boat, and a large number of domestic animals. — Tanum parish, Bohuslän.

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this, they brought a large amount of art into their daily existence. We see, of course, the better side, for the rude and ungainly articles have perished, and only the best have been preserved. Be this as it may, however, the Vikings possessed a very considerable artistic spirit, and their art products are worthy of better attention than

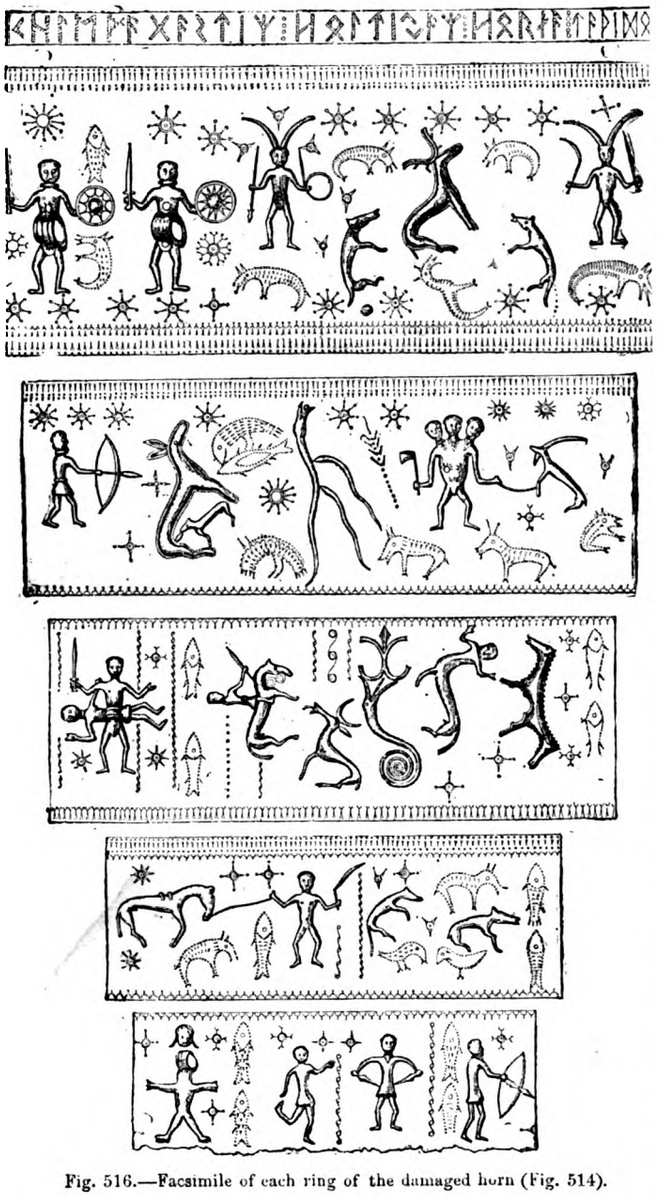


Fig. 516.—Facsimile of each ring of the damaged horn (Fig. 514).

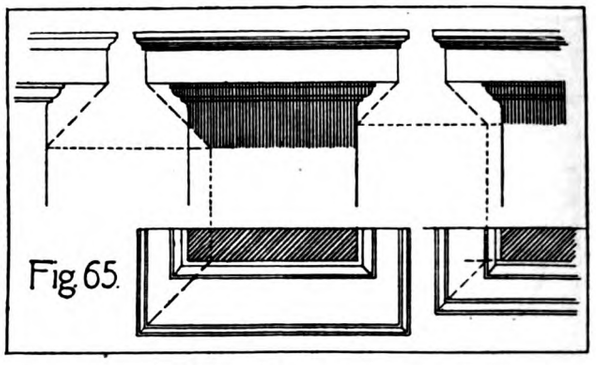
they have hitherto received. They contain lessons of art-industry which this inartistic and utilitarian age may well take to heart, for they show that even the roughest and busiest people may produce beautiful and successful works of art. Barr Ferree.

[We desire to acknowledge the courtesy of the Messrs. Scribner which has enabled us to illustrate this paper with electrotypes from the original blocks. — Eds.]

Peabody Homes in Paris. — Workmen's dwellings on the Peabody principle have now been opened in Paris under the auspices of the Prince d'Arenberg and the members of the Philanthropic Society. The funds for the purpose come from a legacy of £22,000 bequeathed to the "poor of Paris" by the banker M. Armand Heine, who died a few years ago. The Philanthropic Society has already built a house with the money in the Rue Jeanne d'Arc, and the dwellings opened recently are on the Boulevard de Grenelle, the apartments or "rooms" being rented at from £10 to £14 a year, whereas some in the other tenements may be had at a rental of a little over £6. The sanitary arrangements in these *cités ouvrières* are much better than in other parts of Paris, where the working-classes and the utterly indigent live almost side by side; and in this important matter many hints have been borrowed from the London dwellings erected under the terms of the Peabody Trust. It is, in the meantime, devoutedly to be hoped that the Société Philanthropique will extend its operations to other malodorous metropolitan districts besides Grenelle, for such places as the Heights of Montmartre, Belleville and Ménilmontant undoubtedly would derive much hygienic benefit by the destruction of the "jerry-built" and fever-haunted tenements which are numerous in these localities and by the erection of more solid and salubrious dwellings in their stead. — *London Daily Telegraph.*

ARCHITECTURAL SHADES AND SHADOWS.[1] — VII.

CHAPTER VI. — PRACTICAL APPLICATIONS OF FOREGOING PRINCIPLES (*Continued.*)

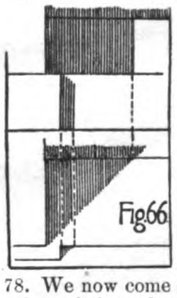


THE first part of this chapter, already published, was occupied with a résumé of general principles of shadow-casting as applied in the draughtsman's practical work, and with the solution of two or three particular problems suggested by certain parts of Plate III. The remaining portion of this chaper will take up *seriatim* the operations involved in the construction of that plate.

75. The shadows of the different parts of the porch divide themselves at once into two main divisions; one comprising those which fall upon the several plane-surfaces of the porch itself, and the other, those which are cast upon the main wall of the building. The former are nearly all cast by lines parallel to the plane of incidence, and present no difficulty whatever. Such are the shadow of the corona cast upon the front of the porch above the arch, of the fillet upon the corona, of the archivolt upon the face of the porch, of belt-courses, imposts, etc., upon the piers to which they belong. The most important of these may be taken first, and the shadow of each part of the broken line forming the edge of the corona drawn upon the front of the porch parallel to the edge that casts it. It is worth noticing that when a projecting member like a cornice or belt-course truly mitres around the corner of a building standing in what we have called a "principal" position, the shadow of its left-hand lower corner falls precisely on the left-hand corner of the frieze or wall below it. But whenever the forward and the lateral overhang are not the same, the plan or the side-elevation must be used to find the shadow of that corner (that is of the left-hand end of its front lower edge) and the width of the shadow of the cornice or member upon the wall. This is illustrated in Figure 65, where the forward projection is in one case greater, in the other less than the lateral. It is not always safe to assume a true mitering in the case of all cornices and mouldings, without referring to the side-elevation.

76. Next come the shadows of minor members — of the fillet of the cornice cast upon the corona, and of the fillet of each impost, cast upon the fascia immediately below it. We may then find the centre of the shadows of the extrados and intrados of the archivolt-mouldings, which will be on a line drawn at 45° through the centre of the arch, and at a distance from that centre horizontally and vertically equal to the projection of the archivolt from the face of the wall. (See 42.)

77. The right vertical corner of the left stair-parapet (disregarding the cap and base) casts a vertical shadow on each riser at a distance to the right equal to its own distance in front of it, as ascertained from the plan. But the shadow of the upper right horizontal edge of the parapet is a line at 45° crossing the risers, and limits the shadow of the vertical corner between the third and fourth riser. Upon the lowest riser falls the shadow of the vertical corner of the base, and the shadow at 45° of the short upper horizontal edge of the base that returns in to this step. This is made clearer by the detail on a larger scale in Figure 66. Upon the top riser falls the shadow of the right corner of the left pier of the porch, its distance to the right ($z'y'$) being found from the point y in the plan.



78. We now come to the shadows on the main wall and draw the simplest of these first. The shadow of the right-hand front corner of the porch may be drawn as an indefinite vertical line (disregarding the impost and cornice), its position being determined either by the point x on the plan, or by laying off its distance to the right equal to

[1] By A. D. F. Hamlin, Assistant Professor of Architecture in the School of Mines, Columbia College. Continued from page 149, No. 718.

NOTE. — [In view of the inconvenience of having to refer to back-numbers for explanations of the notation used in these papers, the following memorandum will be found of service.]

HP = horizontal plane of projection; $V'P$ = vertical plane of projection; GL = ground-line or horizon. Capital letters designate points and lines in space, small italics their horizontal projections, and the same accented or "primed," their vertical projections. Subscript figures indicate points of shadow: small figures above the line indicate points of shade. Greek letters (α, β, γ, θ, δ,) designate angles. The *diagonal* of a line or dimension is its length multplied by $\sqrt{2}$.

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the depth of the porch as shown by the plan or section. The shadows of the left further corner of this pier and of the corresponding corners of the left-hand pier can also be located in the same manner as indefinite vertical lines, and the shadow of the upper right-hand receding edge of the cornice drawn as an indefinite line at 45°.

79. Let us now observe that the point a'_1 is the last point of the line of shade of the right-hand pier to cast any shadow, a'_2 being its shadow and also the shadow of a' on the edge of the corona. We, therefore, have a case like that described in 67, and proceed to draw $a'_2 b'_1$ the horizontal shadow of $a'b'$, which is that portion of the line of shade of the corona whose shadow does not fall on the face of the porch, and, therefore, does fall on the main wall. The next portion of the line of shade is the right vertical corner of the corona whose vertical shadow is $b'_1 c'_2$. But c'_2 is again the common shadow of two points c'_1 and c', the latter on the edge of the upper fillet being a point on the next portion of line of shade to be accounted for. This portion is evidently that to the right of c', since all the fillet to the left of this point casts its shadow on the corona. The shadow of this short line on the main wall is the horizontal line $c'_2 d'_1$; and the next shadow is that of the vertical corner of the same fillet, which must be $d'_1 e'_1$, and as this brings us to the shadow already drawn of the receding upper edge of the fillet, which is the next and final part of the line of shade, this part of our work is complete.

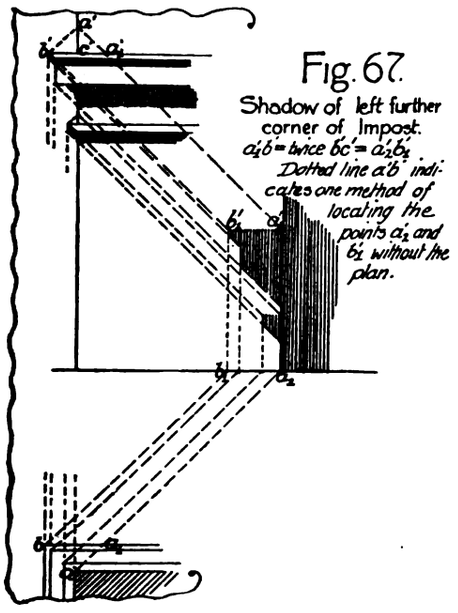
Fig. 67.
Shadow of left further corner of Impost.
$a'_1 b' = \text{twice } bc = a'_2 b'_2$
Dotted line $a'b'$ indicates one method of locating the points a'_2 and b'_2 without the plan.

80. We next treat the right-hand corner of the impost in the same way. The plate shows by dotted lines the complete or theoretical shadow of both the upper and lower edges of this impost-fascia with its fillet, which enables us to draw the shadow of its left-hand further corner, the treatment of which is made clearer by Figure 67. The same operation is performed for the corresponding corner of the left-hand pier. The shadow of the right corner of the further pier is hidden behind the wider front pier, but the shadow of the right-hand end of the lower front edge of its impost reaches exactly to the corner of the doorway (at f') across the narrow bit of wall left visible by the wide front pier.

81. The shadow of the front edge of the arch of the porch on the main wall is, of course, a semicircle, drawn from the shadow of the centre of the front edge of the arch. A small arc of this semicircle is seen at the left of the right-hand pier, near the bottom. The rest of the shadow of the arch on the same plane, completed by casting in the same way the semicircular shadow of its further or inner edge, comes to view at the right of the porch. It reveals the fact that the right-hand side-arch must be all in shadow, since the dotted lines, which show the shadows of its two edges (drawn as explained in 74), are swallowed up in the shadow of the porch itself. It not infrequently happens (as would have been the case had we cast the shadows of these side-arches before drawing that of the front-arch) that shadows carefully drawn out in the earlier part of the work prove superfluous, being swallowed up by other shadows drawn at a later stage of the work. This fact, of course, proves the lines casting the former shadows to have been no lines of shade at all, being themselves in shadow; and such superfluous work can be avoided only by carefully considering the relative positions of the different parts of the building, and observing which among them are in the shadows cast by others. Nor can this always be determined by inspection; a certain amount of seemingly superfluous work must be done in such cases; but its amount may be much lessened by a careful study of the relations of the different parts of the edifice.

82. The shadow of the left-hand side-arch is drawn as explained in 74, and need not be further dwelt upon. So also the shadows cast by the railings under these arches have been already sufficiently explained to require no further notice here. There remains only the plan to be studied.

83. The shadows on a plan are cast upon the supposition that the plan is taken at a comparatively short distance above the main floor; this distance being arbitrarily assumed within certain limits, and the building supposed to terminate at that level. A plan is, in other words, a horizontal section taken at such a level as to show all the principal doors, windows and other openings. The shadows appear on the floor of the buildings, on the treads of stairs, sills of windows and other horizontal surfaces, and on the ground. The outlines of the plan, being horizontal figures, cast upon these horizontal surfaces shadows equal and parallel to themselves, and the vertical corners and lines cast their shadows at 45° across whatever surfaces they fall upon, so that the height of the plan being once assumed, the drawing of its shadows is relatively much simpler than of the shadows of an elevation. This explanation, with the general instructions already given, should suffice to enable the student to cast all the shadows shown on the plan in Plate III, especially if he bear in mind that for all those portions of the building *below* the plane of horizontal section, the shadows of the plan and of the elevation supplement each other. Whatever portion of the shadow of any line of shade does not appear in the elevation, must come into view in the plan, and *vice versâ*, as already explained.

84. The section of the porch is nearly all in its own shadow, and need not now engage our attention. It was made a part of the plate in order to make clear such details of the porch as could not be inferred from the plan and elevation, as for example, the railings under the side-arches.

We are now ready to resume the discussion of the properties, relations and forms of the shadows of geometrical solids, the cube and parallelopiped, the prism, especially the octagonal prism, the square and the octagonal pyramid, the cylinder and the cone; these will constitute the next chapter, and will be followed by illustrations of their practical application to the draughtsman's actual work.

(To be continued.)

THE LEAGUE EXHIBITION. — II.

LEAVING the Cathedral designs, we find in the next room a rather small collection of drawings of various sorts, not so striking, as a whole, as the usual League assortment. Glancing over the room, we notice, for the first time at a League show, a considerable number of students' designs from the Architectural Department of Columbia College. These are all compositions on two programmes, and, naturally enough, are very much alike, since originality is a quality which the instructors in design in an architectural school find it best not to encourage much; but they are well studied, some of them showing particularly good and careful drawing of detail, and are rendered with a uniformity of excellence which speaks well for the thoroughness of the teaching in the Department. Next to these, the most interesting objects in the room are the groups of sketches by travelling architects and draughtsmen. Mr. Randall has some more of his pretty and careful water-colors, and Mr. George F. Newton, a recent Rotch scholar, shows a large number of admirable drawings. So far, all the Rotch scholars have been good draughtsmen, and some of them have done work in black-and-white which is rarely surpassed anywhere, but Mr. Newton seems to have had either a special gift or unusually good training in color. One of the best shown is a drawing of the well-known portal of the Cathedral of Le Puy, but there is a very pretty one of a house at Pompeii, a subject which we do not remember having seen drawn before. Besides these, Mr. Stewardson and Mr. Cope, of Philadelphia, Mr. Rotch, of Boston, Mr. Cary, of Buffalo, Mr. Brunner and Mr. Howard, of New York, have extremely pretty sketches, mostly in color, of interesting foreign subjects, and in addition, Mr. Van Straaten, of Boston, shows some beautiful colored sketches of old Dutch town buildings, which merit special mention, not only for the skill with which they are executed, but for the novelty and interest of their subjects. In a conspicuous place in the room are hung two frames of sketches, mostly in pencil, by Mr. Whitney Warren, of New York, one of which is marked, with an unmistakable French label, "Mention Honorable," as if they had been found worthy of special distinction in some exhibition in France. The sketches are well enough, being painstaking, though feeble and stiff; but it is a gratification to find that a lot of sketches which are far surpassed by many others in the room should have been found deserving of public honors by a French jury.

Turning to the subjects in which the design as well as the drawing is an American product, our attention is immediately attracted by several interiors, in full color, designed by Mr. Arthur Little, of Boston, and drawn by Mr. Fernald. The design in these is of the delicate, quiet sort which we have learned to expect from Mr. Little, but the drawings are studies of still-life in water-color, of remarkable merit. In one, particularly, the scene contains a dining-table, spread, and

[1] Continued from page 41, No. 734.

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each saucer and decanter is studied, apparently from nature, with the same care and success as the flowers in the wall-paper pattern. Another one, the difficulty of which is not so apparent to the ordinary observer, shows a room decorated in blue-and-white, the blue being mainly supplied by a wall-covering of what seems to be Japanese cretonne, in a characteristic Japanese pattern of blue on a white ground. The rendering of one of these delicate and intricate patterns would be troublesome enough, but with Japanese work of the kind the ground is never, or very rarely, really white, and the representation of the subtile tint by which the peculiar tone of the original is given forms about as trying a problem as a water-colorist can set himself. Among the other things which we have particularly marked for commendation in this room are a sketch for a country hotel, by Messrs. Mason & Rice, of Detroit, which is one of the prettiest and most picturesque things in shingles that we have ever seen; a design for a soldiers' monument, by Mr. E. R. Tilton, of New York, a pure and beautiful classic composition, thoroughly well studied and well proportioned, and beautifully drawn; and a drawing of an entrance court in an insurance building in Minnesota, by Messrs. Babb, Cook & Willard, of New York. This last was to a certain extent a revelation to us. We had never been able to understand why Messrs. Babb, Cook & Willard, skilful as they are, should be employed to build huge insurance buildings all over the country, to the exclusion of native talent, but this drawing shows an interior filled with an amount of beautiful and original design which would have sufficed to spread out over a thousand buildings of the sort which has hitherto been generally thought good enough for life-insurance offices; and it may well be that insurance officials, who have plenty of money to spend on handsome offices, have come to the conclusion that they like something better than the old commonplaces, and have begun to go to the architects whom they believe to be best able to give them what they want.

With these are some designs interesting for various reasons. Messrs. Rossiter & Wright have three or four sketches, two of which, at least, are in their best vein, which is about the highest praise that could be given them. Messrs. Brunner & Tryon have also several pretty designs and drawings, one of which is a curious sketch for the "Norumbega" tower lately built near Boston in commemoration of the settlement of the Norsemen in that vicinity. Our readers probably know that Professor Horsford, of Cambridge, has long interested himself in tracing the indications of the Norse occupation of Eastern Massachusetts in the thirteenth century. The old Indian traditions showed, at the time of the landing of the Pilgrims, that a colony of white men, called by the Indians "Norumbega," had existed ages before in the neighborhood of what is now Boston. It did not require any remarkable philological insight to arrive at the conclusion that the word "Norumbega" was a corruption of "Norway," or "Norgé," to use the present Norwegian spelling, softened by the Indians into "Normgé," and improved by the Puritans, who liked to give a neat turn to the barbarous words which they found, into "Norumbega." Acting on this hint, Professor Horsford compared the present topography of the Charles River valley with that described in the accounts of "Norumbega," and came to the conclusion that the confluence of the Charles River and Stony Brook had formed the site of a large and flourishing settlement, extending as far as Newton, where canals and other works, built, as he thinks, by the Norse settlers, are still to be seen. Having become convinced of the importance of his discovery, Professor Horsford determined to commemorate it by a permanent memorial, and this design of Messrs. Brunner & Tryon is the result. They have obviously taken the "Stone Mill" at Newport for a model, but they could hardly have had a better one, and the result is very pleasing.

We keep for the last a group of designs by Messrs. Mellen, Westell & Kirby, which affords us all the pleasure that we anticipated from them. The best, to our mind, is a "Sketch for a Clubhouse," which is simply enchanting in its picturesqueness, its sunny wall-surfaces, unaffected window-grouping and its rich and lovely detail. The style is the French Transition, which Mr. Kirby loves and understands so well, but no real example that we know of has half the expression and variety of Mr. Kirby's composition. Near this is a design for a hotel in Colorado, very noble as well as picturesque, and next to this a study for an interior, a novelty from Mr. Kirby, but as full of ideas and architectural feeling as his exterior groups. Besides these, there are some sketches for country houses, interesting, but not always as successful as the ones just mentioned.

Jewels in Burmese Temples. — The Buddhists in Burmah do not consider the question of expense in beautifying their temples. Here is the description of the new vane of the pagoda at Rangoon: The vane is about three by one and a half feet broad, and thickly crusted with precious stones and lovely fans of the red Burmese gold. One ruby alone is worth 6,000 rupees, and there are several hundred rubies alone on this beautiful thing. On the tip of the iron rod on which works the vane is a richly-carved and perforated gold ornament called the Semboo. It is somewhat egg-shaped and a foot in height, tipped by an enormous diamond encircled by many smaller ones, crusted on like barnacles. All over this exquisite oval object are similar clumps of diamonds, no other stones being used for this part. — *Exchange.*

THE PREHISTORIC RUINS AND WORKS OF ART OF YUCATAN.

THE most significant fact supporting the conjecture that the architects and builders of the towering pyramids, terraces and temples of Yucatan and Guatemala were survivors of the flood that, according to Biblical records, overswept the earth and destroyed all forms of animal life save Noah and his family, and the parent animals in the ark, is that high elevations and plateaus were chosen for the sites of the structures, and that these structures themselves were made lofty and imposing and massive, and well-calculated to resist the floods. But even in this respect the founders of the cities did not go as high as they might have gone with their buildings, while the ruins that give evidence of densest population were on the lower plateaus, where a milder and more salubrious climate was to be found, and there is a noticeable absence from the carvings and mouldings in stone and stucco with which the principal edifices are profusely ornamented of any references to any real or mythological deluge.

Comparisons have furthermore been attempted between the pictorial and hieroglyphical inscriptions upon the monuments of these Spanish-American States and those of Egypt and Asia, and here the same absence of important requisites to a similarity are found. Except in the pyramidal forms of some of the structures and the massive stone cornices of others, that are characteristic of all the ancient edifices of the prehistoric world, there is nothing in the American structures to indicate that their principles of construction were derived from any other land. The peculiarities of the American structures, furthermore, seem to demonstrate the unqualified originality of their designs and principles of construction. The law of continuity, that in all other matters of history proves the relationship of things to each other, and demonstrates the theory of evolution, seems to avail nothing in solving the mystery of this ancient and extinct civilization. Perhaps the discoveries have not yet been carried far enough. Perhaps when the probes of science shall have been diligently and exhaustively applied to these ruins there may be disclosed some remains of the tools and machines with which these richly-sculptured monoliths were taken from their distant quarries, put in shape, transported and raised to their places in the vast temples and strongholds where they still exist. Perhaps, then, there may be discovered some traces of the implements of weaving, grinding, enamelling, compounding of pigments and metal-work, the fruits of which are illustrated in the carvings and mouldings with which the walls of these vast structures and the monolithic idols are ornamented. These and such implements of domestic use — even possible literary remains — as may still be hidden in the ancient and now subterranean chambers and halls of this extra-historic race may, when found, establish the connection, between that race and the rest of mankind and solve the question of priority of origin.

There are, at least, thirty extensive sites of ancient centres of population, with their architectural remains in more or less dilapidation and ruin, some differing greatly from others in their main characteristics; besides continuous chains of improved roadways and remains of once inhabited villages, connecting the principal ruins, and demonstrating beyond doubt a vast population of great antiquity and of greater intelligence and energy by far than the natives found not in but about these ruins by the Spanish conquerors. Nor do these take into account the ancient ruins of old Mexico and the border lands of the United States lying to the northward. These were diligently explored by Lord Kingsborough in the early part of this century, later by Humboldt, and still later by Désiré Charnay, a Frenchman who spent many years of his life among the Mexicans, and who, under the patronage of Pierre Lorillard, made a further tour of exploration into a mountainous region in the southwestern parts of Yucatan, and demonstrated the fact that this hitherto unexplored region was also rich in material for the archæologist.

For the rest of his travels in Yucatan, Charnay seems to have taken Stephens for his guide, and after visiting some of the easiest accessible of the ruined cities described by him, has incorporated Stephens's descriptions and Catherwood's pictures into his own handsome volume, giving the Americans proper credit for their work. Charnay's work, "*Les Anciennes Villes du Nouveau Monde*," was published in Paris in 1886. To the facts respecting Guatemala and Yucatan before revealed by Stephens, he adds a description of an extensive ruin which, in honor of his patron, he called Lorillard, and of some pottery found there. Lorillard is in the mountains, in latitude 17° north and longitude 94° west of Paris. It is about midway between the fields of Stephens's explorations and occupies a central point in a still unexplored region, the dense forests and mountainous character of which have balked the intentions of all these and some other would-be explorers. Others have followed in the wake of

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these explorers, but have added little but cumulative information to the knowledge given of these ruins by the persons named.

Copan, an ancient ruin occupying the left bank of the Copan River, in the State of Honduras, was the first of these important sites visited by Stephens and Catherwood. Once only before had they been explored by a civilized man. In 1836 they were visited by Colonel Galindo under a commission from the Central American Government, and his report was published in the *Proceedings* of the Royal Geographical Society of Paris and in the *Literary Gazette* of London. "He is the only man in that country," Stephens says, "who has given any attention at all to the subject of antiquities, or who has ever presented Copan to the consideration of Europe and our own country. Not being an artist, his account is necessarily unsatisfactory and imperfect, but it is not exaggerated. No plans or drawings have ever been published, nor anything that can give any idea of that valley of romance and wonders, where, as has been remarked, the genii who attended on King Solomon seem to have been the artists."

The ruins are about three hundred miles from the sea, up the Motagua River to the Copan, and a short distance up that changeable stream. The Copan is not navigable, except for canoes, and then only in the rainy season, for short distances between falls. The valley is one of the most fertile in Central America. The ruins run for two miles along the river's bank, as is clearly established by monuments and remnants of stone walls and buildings still in existence above the surface of the ground. "Cortez in his terrible journey from Mexico to Honduras, of the hardships of which even now, when the country is comparatively open and free from masses of enemies, it is difficult to form a conception," Stephens says, "must have passed within two days' march of this city. There is one monument on the opposite side of the river at the distance of a mile, on the top of a mountain 2,000 feet high. Whether the city ever crossed the river and extended to that monument, it is impossible to say. I believe not. At the rear is an unexplored forest in which there may be ruins. There are no remains of palaces or private buildings, and the principal part is that which stands on the banks of the river, and may, with propriety, be called the temple. This temple is an oblong inclosure. The front or inner wall extends on a right line north and south 624 feet and it is from sixty to ninety feet in height. It is made of cut stones from three to six feet in length and one and one-half feet in breadth. The other three sides consist of ranges of steps and pyramidal structures rising from 30 to 140 feet in height on the slope. The whole line of survey is 2,866 feet."

Fourteen stone statues of heroic size, with altars, several gigantic heads and beautifully-carved figures, some only partially emerging from the ground, were found in and about the temple on the pyramidal mounds and walls, indicating that this wonderful ruin was in all probability the Mount Olympus of the numerous and exceptionally cultured people who erected and bowed in worship before these monolithic gods — waiting only for some later Paul to come and declare unto them the God whom they worshipped in their barbarous symbols.

Stephens in frequent paragraphs declares his conviction that the secrets of this interesting race still lie entombed in their monuments and hidden in the accumulations of the centuries that have year by year covered the handiwork of man with verdure, only to have it decay and leave a constantly-deepening mold, as if determined to hold those secrets sacred from the unworthy, and only to be revealed to that later generation that comes equipped with the implements of science and a thirst for the knowledge of the truths these monuments are willing to reveal when faithfully courted.

All about Copan are evidences of greater and more interesting facts than even were so wonderfully apparent in the ruins still surviving the conflict with that marvellously luxuriant vegetable kingdom that seems destined to hide the whole great revelation deep in the bosom of earth, an everlasting secret of the centuries, unless man, in power of numbers and implements, comes to the rescue.

Stephens's account of Copan is replete with references to diagrams and illustrations, the text alone filling thirty pages of his quarto volumes. It is one of the most important of the entire number of ruined cities visited and explored by him, confounding and making ridiculous as it does certain dilettanti in archæology, who have endeavored to minimize the importance of the discoveries and ascribe to the race of builders ethnic identity with the semi-barbarous Aztecs, Moquis, and North American Indians.

Near the southwest corner are two small pyramidal structures, the larger attached to the wall skirting the west bank of the river, with, between the pyramids, what seems to have been a gateway or principal entrance from the water. The south wall is at right angles from the river, beginning with a range of steps thirty feet high, each step about eighteen inches wide. "At the southeast corner is a massive pyramidal structure 120 feet high on the slope. On the right are other remains of terraces and pyramids; and here also was probably a gateway opening by a passage about twenty feet wide into a quadrangular area 250 feet square, two sides of which are massive pyramids 120 feet high on the slope. At the foot of these structures, and in different parts of the quadrangular area, are numerous remains of sculpture. At one point (indicated) is a colossal monument, richly sculptured, fallen and ruined. Behind it, fragments of sculpture, thrown from their places by trees, are strewed and lying loose on the side of the pyramid, from the base to the top." Colossal heads of monkeys, enshrined alto-relievo portraits of heroes, and one image of an ape, like those worshipped at Thebes, were among the cumuli on the sides of these pyramids. At a point on the eastern slope of the terrace stands one of the monolithic "idols" which give the peculiar character to the ruins of Copan. It stands with its face to the east, about six feet from the base of the pyramidal wall. It is thirteen feet in height, four feet in front and three deep, sculptured on all four of its sides from the base to the top, and is one of the richest and most elaborate specimens in the whole extent of the ruins. "Originally it was painted, the marks of red color being still distinctly visible. Before it, at a distance of about eight feet, stands a large block of sculptured stone, which the Indians call an altar." A full-page engraving of this monolith forms the frontispiece of Stephens's volume. It shows on the face a full-length figure without beard, and of a feminine cast, though the dress seems that of a man. Here and there on the front of the figure forming part of the gorgeous trappings of the image, are small engraved medallion portraits, some of male, some of female faces. The heroic figure is gorgeously arrayed and the sides and rear of the shafts are covered with hieroglyphs, that probably recite the history of the mysterious personages.

Diagonally across the angle of the wall and facing south is another monument or idol of the same size and in many respects similar. "The character of this image, as it stands at the foot of the pyramidal wall, with masses of fallen stone resting against its base, is grand, and it would be difficult to exceed the richness of the ornament and sharpness of the sculpture. This, too, was painted, and the red is distinctly visible. The whole quadrangle is overgrown with trees and interpersed with fragments of fine sculpture, particularly on the east side, and at the northeast corner is a narrow passage which was probably a third gateway. On the right is a confused range of terraces, running off into the forest, ornamented with death's heads [subsequently understood by Mr. Stephens to be gigantic figures of monkey's heads], some of which are still in position and others lying about as they have fallen or been thrown down. Turning northward, the range on the left hand continues a high, massive, pyramidal structure, with trees growing out of it to the very top. At a short distance is a detached pyramid, tolerably perfect, about fifty feet square and thirty feet high. The range continues for a distance of about 400 feet decreasing somewhat in height, and along this there are but few remains of sculpture.

"The range of structures turns at right angles to the left and runs to the river, joining the other extremity of the wall, at which we began our survey. The bank was elevated about thirty feet above the river, and had been protected by a wall of stone, most of which had fallen down." Among the fragments lying on the ground on this (north) side was a large medallion portrait, the serene and majestic expression and noble outlines of which betoken a monarch or a deity. "The plan [of the entire ruins] was complicated, and, the whole ground being overgrown with trees, difficult to make out. There was no entire pyramid, but, at most, two or three pyramidal sides, and these joined onto terraces or other structures of the same kind. Beyond the wall of enclosure were walls, terraces and pyramidal elevations running off into the forest, which sometimes confused us."

Among the many monuments and sculptured shafts found within the walls was an altar presenting, perhaps, as curious a subject of speculation as anything in Copan. "It stands on four globes cut out of the same stone; the sculpture is in bas-relief, and is the only specimen of that kind of sculpture found at Copan, all the rest being in bold alto-relievo. It is six feet square and four feet high, and the top is divided into thirty-six tablets of hieroglyphics, which, beyond doubt, record some event in the history of the mysterious people who once inhabited the city." The sides of this altar are engraved with figures of individuals. "Each side represents four individuals. On the west side are the two principal personages, chiefs or warriors, with their faces opposite each other, and apparently engaged in argument or negotiation. The other fourteen are divided into two equal parties, and seem to be following their leaders. Each of the two principal figures are sitting cross-legged, in the Oriental fashion, on a hieroglyphic, which probably designates his name and office or character, and on three of which the serpent forms part. Between the two principal personages is a remarkable cartouche, containing two hieroglyphics well preserved."

On the side of the court toward the river there is an opening about half-way up the steps, forming "a pit seventeen feet deep and five feet square, cased with a stone. At the bottom is an opening two feet four inches high, with a wall one foot nine inches thick, which leads into a chamber ten feet long, five feet eight inches wide and four feet high. At each end is a niche one foot nine inches high, one foot eight inches deep and two feet five inches long. Colonel Galindo first broke into this sepulchral vault and found the niches and the ground full of red earthenware dishes and pots, more than fifty of which, he says, were full of human bones, packed in lime. Also several sharp-edged and pointed knives of chaya, a small death's head carved in a fine green stone, its eyes nearly closed, the lower features distorted, and the back symmetrically perforated by holes, the whole of exquisite workmanship. Immediately above the pit which leads to this vault is a passage through the terrace to the river," barely large enough for a man to crawl through on his face. "There were no remains of buildings. In regard to the stone hammock mentioned by Fuentes, and which, in fact, was our great inducement to visit

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these ruins, we made special inquiry and search for it, but saw nothing of it. Colonel Galindo does not mention it. Still, it may have existed, and may be there still, broken and buried. The *padre* of Gualan told us that he had seen it, and in our inquiries among the Indians we met with one who told us that he had heard his father say that his father, two generations back, had spoken of such a monument."

Some of the monuments were with infinite patience and perseverance dug out of the ground from under the very roots of giant forest trees by these American explorers, and their inferences are plainly made, that by no means all the stones upon which the history of the builders is inscribed in everlasting characters were found. "Of the moral effect of the monuments themselves," Stephens says, "standing, as they do, in the depths of a tropical forest, silent and solemn, strange in design, excellent in sculpture, rich in ornament, different from the works of any other people, their uses and purposes, their whole history so entirely unknown, with hieroglyphics explaining all, but perfectly unintelligible, I shall not pretend to convey any idea. Often the imagination was pained in looking at them." This and the important revelations the archæological emblems hold in store for the coming of the proper day the explorer properly leaves to the skill of the scientist. — *New York Times.*

SOME FURTHER NOTES ON THE PAINTING AT TZINTZUNTZAN.[1]

THE surprise of the art-loving world over the existence of a supposed Titian in an obscure Indian village of Provincial Mexico might be somewhat mitigated by directing attention to the relations existing between Spain and Mexico in the sixteenth century. The Spanish sovereigns Charles V and Philip II were devoted to the cause of evangelization in their possessions in the New World, and they and others of Spain did much towards the enrichment of the magnificent churches built in Mexico, by contributing works of art. So that prior to 1860 the churches of the city of Mexico were said to contain many art treasures derived from European sources. The chapter-room of the Cathedral still contains a Murillo and a Pietro de Cortona. When the so-called "Reform" laid its heavy hand upon the churches of the capital in 1860, many of these paintings went into the Academy of San Carlos, as the property of the government. Upon the walls of the Academy are now to be seen, a "San Juan de Dios," by Murillo (a replica of one of his paintings for the Charity Hospital in Seville), besides two pictures attributed to him,— a "San Rafael" and a "San Juan del Desierto." Rubens is represented in the Academy by a portrait of himself and a "Christ tormented." There is also a "San Sebastian" attributed to Van Dyke, together with quite a number of paintings from the Seville school. It is sometimes said under the breath in the Mexican capital, that some of the greater art treasures of the churches were secreted by ecclesiastics in anticipation of the destruction and robbery that went on in the execution of the "Reform" laws, and have not yet emerged from their hiding-places.

The relations of the Spanish sovereigns to the missionary work in New Spain in general and to that which went on in and about Tzintzuntzan in particular, render it quite reasonable to suppose that the picture in the dilapidated church in that decayed Indian village is a veritable Titian, not the work of an inferior painter, represented to be by that great master, nor a copy by one of his pupils.

In 1528, Charles V (of Netherlands, I of Spain), being the Emperor of Spain and vast possessions in the New World, it was deemed advisable to establish some sort of a check upon the military government of New Spain or Mexico; and with that intent a Royal Audience was created. It consisted of a certain number of Auditors clothed with judicial powers, and in default of any other governing power the President of the Audience was to assume the duties of Colonial Governor. The first to fill this important post was Nuño de Guzman, who is described as a man of great cruelty and of equal dishonesty. His conspicuous place in history is principally due to his treatment of the Tarascan Indians of Michoacan, who had their chief pueblo at Tzintzuntzan. The pueblo is said to have had a population at that time of 40,000 and the Tarascans had been prior to the Spanish conquest of the country, the only successful opposers in the North of the advancing arms of the Aztecs. Nuño de Guzman's conquest of the country of the Tarascans was attended with treachery of the basest sort and culminated in the burning to death of the last Tarascan chief, the Catzontzin Sinzicha, who had, previous to the advance of Guzman, established amicable relations with the Spaniards and urged his subjects to embrace Christianity.

To counteract the evil done by the first Audience, especial care was taken in the selection of the members of the second, which arrived in Mexico in 1529. The last man on the list of members of this second Audience was Dom Vasco de Quiroga, a Spanish advocate of considerable prominence. He gave his especial attention to righting the wrongs done the Tarascans, fixed his residence at Tzintzuntzan, won the confidence and affection of the Indians and restored to the pueblo much of its former prosperity and importance. In 1530 New Spain was divided into four Bishoprics, one of them being Michoacan. The first ecclesiastic appointed to the See declined, and the Emperor, Charles V, at once urged Quiroga to take orders in the church and to accept the new Bishopric. The result is very suggestive of the history of St. Ambrose and the Archbishopric of Milan in the fourth century. Quiroga, as Bishop of Michoacan, still further won the affection and veneration of the Indians, and his name is reverenced and his memory loved to this day throughout that region.

By imperial grant in 1534, a City of Michoacan was founded consisting of Patzcuaro and Tzintzuntzan,— the preëminence being however given to the latter town. Thus every effort was made to compensate for the wrongs done by Nuño de Guzman in the name of Spain.

It was in 1538 that the "Ill^mus ac. V. D. D. Bascus de Quiroga, Primus Michoacanensium Antistes" took possession of his See in the Church of the Franciscan monastery in Tzintzuntzan, and for two years that church was his pro-cathedral. In 1540 the Episcopal residence was removed to Patzcuaro, which as we have seen was another part of the same municipality, though five leagues distant. In 1579 the See city was removed to Valladolid (the present city of Morelia). The importance of Tzintzuntzan continued to be recognized, and in 1593 it began, with royal permission, the use of its particular coat-of-arms and seal — an elaborate design, minutely described by Beaumont ("*Cronica*," part I, Book II, chap. xx). It bore the title "*Armas del Señorio de la Ciudad de Tzintzuntzan.*"

Charles V abdicated in 1557 and Philip II ascended the Spanish throne. The venerable Bishop Quiroga died in 1565 at the age of ninety-five. He was sixty-seven when consecrated Bishop. Philip II inherited his father's love for Quiroga and interest in the mission work conducted by him among the Tarascans. Tzintzuntzan had scarcely begun to decline before his reign ended. May it not have been to compensate for the removal of the Episcopal residence from Tzintzuntzan that the Spanish court sent one of its art-treasures to that city?

What are now the *parroquia* (the building containing the painting) and the chapel, both dilapidated and decaying, were in the sixteenth and seventeenth centuries portions of the Franciscan monastery. The monastery was closed about the middle of the last century. Patzcuaro has maintained its own, and Valladolid (Morelia) has grown to considerable size, while Tzintzuntzan has decreased in importance and now numbers only about 2,500 inhabitants, all poor Indians. But the Indians of Mexico are careful custodians of documents and pictures, exhibiting an almost superstitious regard for them. It is thoroughly in keeping with the Indian character that all offers made for this painting, even those made by the Archbishop of Mexico, should have been refused. And it is safe to predict that any future effort to take it from its present place will be resisted.

But its authenticity must rest upon internal evidence chiefly, and the object of this paper is merely to show the reasonableness of the existence of an original Titian in such a place. In 1888 the artist and writer, F. Hopkinson Smith, visited Tzintzuntzan and saw the painting, and in "*A White Umbrella in Mexico*" gives a somewhat humorous account of the visit. He gives, also, from Janvier's "*Mexican Guide*" the facts above recited concerning the history of Tzintzuntzan. Janvier obtained the facts from various ancient sources, and the present writer has taken pains to verify them. Mr. Smith embellishes his book (and there has never been a more charming book of travels in Mexico published) with exquisite drawings, one of them being a sketch of the room in which the painting hangs. Whether or not he succeeded in completing his "rough outline of the position of the figures on the canvas" he does not state, but his comments on the picture are valuable.

"The picture is an 'emtombment,' sixteen feet long by seven feet high. Surrounding the dead Christ wrapped in a winding-sheet, one end of which is held in the teeth of a disciple, stand the Virgin, Magdalen, Saint John and nine other figures, all life-size. In the upper left-hand corner is a bit of blue sky, against which is relieved an Italian villa — the painter's own — a caprice of Titian's often seen in his later works.

"The high lights fall upon the arm of the Saviour drooping from the hammock-shaped sheet in which He is carried, and upon the head-covering of the Virgin bending over him. A secondary light is found in the patch of blue sky. To the right and behind the group of disciples the shadows are intensely dark, relieving the rich tones of the browns and blues in the draperies, and the flesh tones for which the painter is famous. The exquisite drawing of each figure, the gradation of light and shade, the marvellous composition, the relief and modelling of the Christ, the low but luminous tones in which it is painted, the superb harmony of these tones, all pronounce it the work of a master.

"The questions naturally arise, Is it by Titian? and if so, how came it here in an Indian village in the centre of Mexico, and why

[1] The addition of the consonant "c" to each syllable of this name (Tczintczuntczan) by some American writers is unauthorized and certainly unnecessary...

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has it been lost all these years to the art world? To the first I answer, if not by Titian, who then of his time could paint it? The second is easier: until the railroads of the last few years opened up the country, Mexico's isolation was complete. . . .

"Another distinguishing feature, and by far the most conclusive, is its handling. Without strong contrasting tones of color Titian worked out a peculiar golden mellow tone — which of itself exercises a magical charm — and divided it into innumerable small but significant shades, producing thereby a most complete illusion of life. This Titianesque quality is particularly marked in the nude body of the Christ, the flesh appearing to glow with a hidden light."

ARTHUR HOWARD NOLL.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF MRS. S. T. EVERETT, CLEVELAND, O. MR. C. F. SCHWEINFURTH, ARCHITECT, CLEVELAND, O.

[Gelatine Print issued only with the International and Imperial Editions.]

GROUP OF BUILDINGS FOR POTTER PALMER, ESQ., CHICAGO, ILL. MR. C. M. PALMER, ARCHITECT, CHICAGO, ILL.

OAK STREET SCHOOL-HOUSE, LEWISTON, ME. MR. GEORGE F. COOMBS, ARCHITECT, LEWISTON, ME.

HOUSE OF ALBERT WILL, ESQ., ROCHESTER, N. Y. MR. OTTO BLOCK, ARCHITECT, ROCHESTER, N. Y.

SKETCH OF STABLE FOR HENRY DOHERTY, ESQ., PATERSON, N. J. MR. CHARLES EDWARDS, ARCHITECT, PATERSON, N. J.

BALVENY CASTLE, SCOTLAND.[1]

"THIS massive and quaint ruin stands on a high bank overlooking the Fiddoch — a stream unknown to fame, which tumbles from the mountains down to the lowlands of Banffshire. The parish of Marnoch, in which it stands, has many curious antiquities, traditionally connected with the Danish wars. These ancient and mostly fabulous legends, have even embraced the object of these remarks, though the oldest portion of the building can be no older than the fifteenth century. A writer of the early part of the eighteenth says: 'Balvanie (in Irish Bal-Beni-Mor, *the house of St. Beyne the Great*, the first bishop of Murthlack), the old castle of which (though rebuilt by the Stewarts, Earls of Atholl, Lords of Balvenie), having been built ('tis said) by the Danes, has a large parlour in it now called the Danes Hall.'[2] In the plate, and between two of the quaint projecting windows, can be read the motto of the Atholl family, which, in its modernized shape, is 'Furth fortune and fill the fetters.'

"When this estate came, as it must have done very soon after the castle was built, into the hands of a branch of the family of Innes, they took first the territorial title of Innermarkie from a portion of the territory acquired from the Atholl family, and subsequently changed it for Balveny.[3] From their alliances and their acquisitions, the Balveny branch of the family of Innes became so powerful that they aspired to the chiefship of the house. The method adopted for the accomplishment of this object involves a complex tragic history, worthy to be told at fuller length than these pages admit of. The Laird of Innes was advanced in years, and childless. He had executed an entail of his estates in favor of the nearest hereditary branch of the family — Innes of Cromy. Robert Innes, of Innermarky and Balveny, endeavored to make a party among his kindred in opposition to this project; but they all approved of the entail; and the intriguer, sent back disappointed and baffled, in the bitterness of his heart resolved to revenge himself, and accomplish his original end by murdering Cromy, and getting possession of the deed of entail. A person situated as Cromy was had to keep his eyes about him, and when he left his fortalice seldom did so without an ample armed retinue. It chanced, however, that having a son attending college in Aberdeen, the youth fell sick and his father went thither affectionately to attend his couch. In the sick-chamber the murderer resolved to accomplish his intention. He entered the town with his followers at dead of night. Cromy's house was within a close or court, the gate of which had been carelessly left open. When the murderers entered the *cul-de-sac*, however, they found that the house itself was shut up, and pretty strongly barred, so that they could not have stormed it without a more serious disturbance than it was expedient to raise in the heart of a town. There were then great feuds between the Gordons and their hereditary enemies, and as Cromy was a partisan of the Gordons, Balveny adopted the device of shouting their war-cry. The trick succeeded: the victim descended half-dressed, with his sword in his hand, and opened the door, when he was immediately shot by his enemy. There were some kinsmen of the assassin present who, probably, did not anticipate this tragical conclusion of the proceedings, for he took the brutal precaution of compelling them to bury their dirks in the body, that they, too, might be partners to the transaction. The efforts made to recover possession of the entail are another chapter in the romance. It can only be here said that the plotter succeeded in being, for a short time, the ostensible head of the house; but the son of the murdered man pursued him with hereditary hatred. He was forced to conceal himself; but his lurking-place was discovered. He was put to death without trial, and his head was cut off and sent to court.

"Nearly a century later, the descendant of the murderer had a contest with the head of his family conducted in the courts of law, which had then begun to supersede the old methods of 'speedy justice.' The devices he adopted to strengthen his hands were, however, curious enough of their kind. The plan for the creation of Baronets of Nova Scotia having been started, Balveny endeavored to obtain one of the patents, that he might have higher rank, and consequently greater influence than his chief; or, as the family historian expresses it, 'having law for it, he would baffle his cheiff, and take the door of him, or put him to the necessity of being lord, which his circumstances could ill bear.'[4] He was, however, defeated by the equal, if not superior cunning of his rival, and became what was generally called a broken man — the ruiner of his house. 'And to follow it out to the close,' says the historian, 'Sir Robert Innes of Balveny, who broke his own estate, had a son, Sir Walter, who succeeded him to the name, but not the land. Sir Walter's circumstances were but mean, he left no heirs, and in his death the family extinguished, he being the eighth generation from the first Walter who founded it.' And, mentioning some cadets of the family, he says, — 'The last come of the house of Balveny, and nearest that family, (were there anything to represent) is Mr. George Innes, a priest, who possesses a small interest in Angus, called Dunnoine: what lawful heirs-male he can have I know not.'"[5]

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

[2] View of the Diocese of Aberdeen, p. 649.

[3] Historical Account of the Origine and Succession of the Family of Innes, collected from Authentick Writs in the Chartor Chist of the Samen. — From an original manuscript in the possession of His Grace the Duke of Roxburghe, p. 47.

[4] Historical Account of the Origine and Succession of the Family of Innes, collected from Authentick Writs in the Chartor Chist of the Samen. — From an original manuscript in the possession of His Grace the Duke of Roxburghe, p. 62.

[5] Ibid. p. 63, 64.

[Additional Illustrations in the International Edition.]

INTERIOR OF THE RECOLETU CHURCH, SANTIAGO, CHILI.

[Gelatine Plate.]

THIS interior is finished entirely in marble.

INTERIOR OF THE HOF KIRCHE, INNSBRUCK, TYROL.

[Gelatine Print.]

This church was built 1553–63 and contains the famous tomb of Maximilian I, whose kneeling figure, crowning the tomb itself, faces the high altar. The body of Maximilian is not, however, here entombed although both church and tomb were erected in consonance with the provisions of his will. Upon each side of the nave stand fourteen bronze figures of heroic size which represent, mainly, members of the House of Austria, to which have been added effigies of several notabilities who cannot be claimed as even remote connections. These statues stand in the following order, beginning on the right as the church is entered: 1, Clovis, King of France; 2, Philip I of Spain, son of Maximilian; 3, Rudolph of Hapsburg, founder of the Austrian dynasty; 4, Albert the Wise, Duke of Austria, the Emperor's great-grandfather; 5, Theodoric, King of the Ostrogoths; 6, Ernest the Iron-hearted, Archduke of Austria and the Emperor's grandfather; 7, Theobert, Duke of Burgundy; 8, Arthur, King of England; 9, Sigismund, Count of Tyrol; 10, Bianca Maria Sforza, second wife of Maximilian; 11, Margaret, his daughter; 12, Cymburgis, wife of Ernest the Iron-hearted; 13, Charles the Bold, Duke of Burgundy; 14, Philip the Good, father of Charles the Bold.

On the opposite side are: 1, Joanna, wife of Philip I and mother of Charles V; 2, Ferdinand the Catholic, King of Aragon and father of Joanna; 3, Kunigunde, sister of Maximilian; 4, Eleonora of Portugal, mother of Maximilian; 5, Mary of Burgundy, first wife of Maximilian; 6, Elizabeth, wife of the Emperor Albert II; 7, Godefroy de Bouillon; 8, Albert I, Duke of Austria; 9, Frederick of the Empty Purse; 10, Leopold, the Pious; 11, Rudolph IV, Count of Hapsburg; 12, St. Leopold; 13, Frederic III, Emperor of Austria and father of Maximilian; 14, the Emperor Albert II. These figures are mainly the work of Gregory Löffler and the brothers Godl. The sides of the tomb itself are decorated with twenty-four bas-reliefs of great beauty and delicacy, most of which are the work of the sculptor Alexander Colin of Mechlinberg.

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A WAREHOUSE, STOCKHOLM, SWEDEN. A. EGENDOMEN, ARCHITECT.

Reproduced from *Teknisk Tidskrift*.

ALL SAINTS' CHURCH, LEEK, ENGLAND. MR. R. NORMAN SHAW, R. A., ARCHITECT.

INTERIOR OF ALL SAINTS' CHURCH, LEEK, ENGLAND. MR. R. NORMAN SHAW, R. A., ARCHITECT.

GARDEN FRONT, HOLCOMBE, CHATHAM, ENGLAND. MR. JOHN BELCHER, ARCHITECT.

THE NEW BOURSE DE COMMERCE, PARIS, FRANCE. M. H. BLONDEL, ARCHITECT.

This building faces the Rues du Louvre, de Viarmes and Coquillière. Because of the shape of the lot the wings of this structure partly mask the colonnade and dome of the main building, therefore in this illustration, reproduced from *La Construction Moderne*, these accessory buildings are omitted. These wings are used for shops in the lower story while a hotel and apartments occupy the upper floors.

A NEW YEAR'S DAY IN THE OLDEN TIME.

Among the artists who prefer to devote themselves to the illustration of books and periodicals the foremost places must be assigned to Messrs. Jellicoe and Railton. One is as successful as a figure-draughtsman as his companion is with architectural subjects. For the large plate which we publish this week we have been fortunate to obtain the combined ability of the two artists. The scene they have produced is thoroughly English in character. The village green appears surrounded with picturesque houses, but the introduction of the smith's forge suggests how, in the old days, convenience was preferred to the establishment of an exclusive quarter. The picture also suggests that among the English there were various ways to level the distinctions between classes and masses. Winter was a successful operator in that way; and, as we see in the picture, the venerable gentleman, with eyes severe and beard of formal cut, is given an opportunity to utter his wise saws and modern instances on the philosophy of accommodating oneself to circumstances. He takes his punishment with good humor, and in a little time may become the aggressor. It is not often a wintry aspect is so successfully rendered by black-and-white. The whole scene bears not only evidence that snow has fallen, but from the peculiar haze which surrounds the place we know that more is to come. We do not often praise the illustrations we publish, but as Messrs. Jellicoe and Railton's plate differs so widely from those which appear at this season, it may be well to draw attention to the innovation.

BEDROOM AND KITCHEN, CASTELLO DI VINCIGLIATA, NEAR FLORENCE.

This most interesting castle presents an imposing aspect with its crowning towers, encircling walls and battlements, standing as it does on the summit of a hill some two and a half miles from Florence. A splendid view can be had from its ramparts, and a journey out to see the place should not fail to be made by the excursionist. Tickets to view may be obtained at No. 14, Piazza Pitti, from the proprietor, Mr. Temple Leader. This gentleman, who is an Englishman, bought the property in 1855, and has since restored it, the architect being Sig. Giuseppe Fancelli. Considerable skill and ability have been shown in the work of reconstruction, and the rooms contain a vast collection of works of art and antique furniture, some of which may be seen in the drawing accompanying these notes. The history of the Castle of Vincigliata commences soon after A.D. 1000. Its successive owners were the Visdomini, the Usimbardi, the Accordi da Figline, the Buonaccorsi, the Albizzi, and the Alessandri. These last, who had the property in their possession for several centuries, sold the castle in a greatly ruined condition in 1827. As a Mediæval revival, the building certainly possesses an interest peculiarly its own, and the remains of the ancient structure were carefully retained in the rebuilding, which Fancelli carried out. The interior accords with the outside; but to the English architect probably the most interesting portions of the castle will be found inside, where the furniture, lamps, weapons, armor, clocks, and ornaments are arranged *in situ*. The walls of the "Sala del Consiglio" are enriched with frescos above a panelled dado, and the ceiling is vaulted like the Armory and Salotto da Colazione, where heraldic bearings enrich the spandrels. Our view of the brick-groined kitchen is taken looking out of "La Dispensa," which is level with it, and contains some fine chairs and a cabinet of rich detail. The sink and the kitchen fireplace, with the old spit apparatus, are also to be seen. The illustration is reproduced from *Building News*.

FONT AND CANOPY: ST. PETER, MANCROFT, NORWICH, ENG. MR. FRANK T. BAGGALLAY, ARCHITECT.

The restoration of this well-known font-canopy was undertaken at the expense of a Norwich gentleman (who, unfortunately, did not live to see the completion of the work) as a memorial of her Majesty's Jubilee. The lower part of the structure, consisting of the octagonal platform, as well as its cresting and the four posts and four corresponding pendants, are original. Before the restoration they were thickly covered with black paint, and the figures in the niches had been hacked out. A slight structure of no interest, which had once taken the place of the original font-cover, had long been out of use, and was roughly propped upon the platform, over the octagon opening through which the original cover must have slid up and down. Although a careful search was made, no drawing or description of the original upper part of the canopy could be found, and the restoration of the upper part and of the font-cover, which can be slid up into it when the font is in use, is purely conjectural, although founded upon the canopy at Trunch Church in the same county, which is believed to be the only similar structure in the county. The material is oak, and when the black paint was cleaned off it was found that the wood had been at one time colored, though apparently very roughly, in red, green, and white, with gilt crockets, finials, etc., as is usual in late Mediæval woodwork. The old font had lost — evidently by violence — every trace of ornament or moulding, and was replaced by a new one.

THE HOUSE OF SAINT SIMON, ANGOULEME, FRANCE.

During the first half of the sixteenth century it appears that there was but little building in the interior towns in Angoumois. The capital of the province itself only offers us the Maison St. Simon, Rue de la Cloche-verte, at the bottom of a court. This house is so called from the name of the family which built it and inhabited it to the middle of the eighteenth century. Some armorial stained-glass, which formerly decorated the windows of the lower story has recently been placed in the Museum of Angoulême. As the plate shows, the façade, although possessing much movement, is a rather heavy specimen of the architecture held in honor about 1535 to 1540. This fact is especially due to the bold relief of the discs and lozenges which overload the pilasters, and in both cases they have the effect of pieces tacked on rather than actually worked out from the substance of the pilaster. To find anything of a similar kind, we must go as far as Perigord, which shows that this building was probably designed by an outsider. Similar houses can be found at Sarlat, at Ruffec, one which has a very curious inscription and, near Ruelle, quite an elegant little building which is built over the fountain. — *Moniteur des Architectes.*

PALAIS DES ARTS LIBERAUX, PARIS, FRANCE.

For a description of this building, which is reproduced from *La Semaine des Constructeurs*, see our issue for January 11.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE CATHEDRAL DRAWINGS AT THE LEAGUE EXHIBITION.

New York, January 18, 1890.

To the Editors of the American Architect:—

Dear Sirs, — In your number of the 18th instant under the heading of "League Exhibition — I," you say "Even among the pen-and-ink perspectives many are fully rendered, and the shadows cast, while a few, only a minority of the whole, keep strictly to the pure line-work required." I would say that all my plans were sent to the "Trustees of the Cathedral" entirely plain and without a shadow exactly according to their requirements. For the League Exhibition — no stipulation from them prohibiting rendering or shadows, also having been authoritatively informed that some of the designs in the League Exhibition had been sent in to the "Cathedral Trustees" completely rendered and shaded as you had published them — I concluded that I would have my elevations rendered and shaded so that they should not be at the great disadvantage they had been in the exhibition that they were *made* for — the Cathedral Trustees'. Hoping to have relieved myself from the stigma of not being "conscientious" in this regard, I remain Yours truly, R. M. Upjohn.

New York, N. Y., January 21, 1890.

To the Editors of the American Architect:

Dear Sirs, — In the *American Architect* — No. 734 — the notice of the League Exhibition includes some interesting remarks about the New York Cathedral competition.

You have official information from the Trustees, that the instructions to competitors distinctly excluded shading on the drawings and even the blacking of the windows.

Inasmuch as some architects, including myself, are said to have failed to comply with these instructions, will you allow me the necessary space to quote the clauses referred to, as follows:

Clause 2. "There shall be a front and side elevation and a longitudinal section, drawn without shading in pen-and-ink on above scale."

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This is clear. These drawings are required without shading; but if rigidly interpreted it would also exclude the use of two shades of black ink.

Clause 3. "A perspective, etc. This perspective to be in pen-and-ink without painting or shading other than black lining."

Now, if shading had been simply prohibited, as in clause 2, there could have been no doubt; but it seems to me only fair to allow the reading of the last clause to permit such shading as is done in black lines.

This was the interpretation which was put upon it in perfect good faith by several competitors.

I ask your indulgence for this explanation, because I consider it a matter of professional honor to comply with the conditions in all competitions. They are framed in the interests of the profession at large, as well as of their clients, and my purpose now is to show how the mistake arose, rather than to challenge the ruling in regard to it.

Yours truly, R. W. GIBSON.

MR. CONGDON, also, has asked us to call attention to a mistake in the first notice of the League Exhibition which attributed to him a full water-color perspective of the Cathedral of St. John, whereas his drawing, as there shown and as submitted in the competition, was rendered in pen-and-ink after the manner of the illustrations in Wickes's "*Spires*." We learn further that the perspective of Messrs. J. C. Cady & Company was worked up in color after its return by the Cathedral Trustees. — EDS. AMERICAN ARCHITECT.

THE QUEBEC CITY-HALL COMPETITION.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — It is no doubt due in great part to the vigorous preaching of your journal that we begin to see, now and then, properly conducted architectural competitions in this country. People are getting to appreciate the absurdity of expecting our best architects to give time and money to the making of elaborate drawings without some assurance that competitions shall be judged by competent persons, and that the best work shall be duly recognized and fitly recompensed. Believing that the good influence of the *American Architect* is not confined to our country alone, I beg leave to call your attention to a competition which is offered by the City of Quebec. I quote the following extracts from its printed advertisement for "Competitive Plans for a City-hall."

"A prize of $1,500, will be paid for the best plan, $1,000, for the second best, and $500, for the third in value.

"The city reserves the right of proprietorship to any of the other plans submitted on payment to the authors thereof a sum of $100.

"The city does not bind itself to the execution of any of the designs submitted, nor does it bind itself to confide the direction of the work to the architect, to whom the first prize may be awarded."

"The competitors to supply ground-plans, sections and elevations or façades, and the details of the principal apartments, such as the council-chamber and recorder's court. They shall, moreover, supply specification, bills of quantities and estimates of cost of the several works and materials. The total cost of the building inclusive of the heating-apparatus, water and gas service shall not exceed $200,000.

I have not seen many curiosities in this line, but the clause above quoted, requiring competitors to surrender their three or four month's work, if it pleases the committee to offer $100 for it, is certainly a novelty. C.

[THE City of Quebec has a perfect *right* to impose any conditions it may choose, however absurd and unfair, and until architects learn to "boycott" such competitions vigorously and unanimously there will never be an end to such invitations — a word which is by far too decent to apply to such cases. — EDS. AMERICAN ARCHITECT.]

WHAT ARE WORKING-DRAWINGS?

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — What is to be understood by the term "working-drawings" in a specification or contract? Does it cover all necessary detailed drawings, as well as general plans? S. K.

[WORKING-DRAWINGS are generally understood to include general plans, at 1-4 or 1-8 scale, and details. The distinction is, we suppose, between these and the preliminary sketches. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

ARCHÆOLOGICAL DISCOVERIES IN SCANDINAVIA. — Of late several interesting archæological discoveries have been made in Scandinavia. In Norway a burial chamber of the early iron age has been discovered at Gloppen, on the west coast. It contained the remains of a large man, who had evidently, judging from hair and claws beside him, been laid on a bear skin. There were also traces of woollen clothes, and the lining of the neck, woven with ornaments of animals, was well preserved. The most interesting find was the remains of a glass beaker, green and blue in color, with fluted ornamentations. The man had evidently worn a leather belt, with two red stones of quartzite set in bronze, in which had hung a pair of scissors in a wooden sheaf, the latter being carved — a rare discovery. Between the two belt stones lay a curious object, consisting of three pieces of wood linked together, which Norwegian archæologists can only compare to the modern "mind" puzzle. This must have laid between the man's hands. The latter, the beaker, and particularly the ornamental dress lining, are unique finds. All the objects are now in the Bergen museum. An interesting work has just appeared in Norway upon the swords of the later iron age, by Dr. A. Lorange, of the Bergen museum, who, having carefully cleaned these swords in that institution, has found upon them Latin letters and certain marks. One of the commonest names upon them is that of Ulfberht, and Dr. Lorange comes to the conclusion that these swords were not, as hitherto supposed by Norwegian archæologists, made in Norway, but that they were imported from the land of the Franks, on the northwest coast of France. He is further of opinion that several other objects said to be Norse, are of Frankish origin. In Sweden, too, interesting discoveries have been made, viz., at the Igelsta Bay, near Södertelje, where a place has been discovered, which is declared by the celebrated antiquarian, Professor Hildebrand, to have been a kind of manufactory of stone implements during the stone age. This is the more remarkable as the spot is the northernmost in Sweden where flint implements have been found. A little south of the Göta canal, in the province of Skaraborg, a Runic stone, ten feet high, has lain for years, which has been raised. The front bears a cross engraved somewhat like a Maltese cross, below which is the following Runic inscription: Duar, Hatjkr, Haruadr, Rajstu, Stain, Iftjr, Kunar, Fadur, Sin. The translation being: They, Hating and Harvard, raised (this) stone after (in memory of) Gunas their father (lit. father theirs). On the back are cut the figures of three animals, two being a lion and a dog and the third indistinguishable. — *London Globe*.

THE PUEBLO INDIANS AND THE WORKS OF THE RIO GRANDE IRRIGATION COMPANY. — A despatch was sent all over the country recently to the effect that the Pueblo Indians in Bermalilio county had stopped the work on the big ditch of the Rio Grande Irrigation and Colonization Company by threatening to fight if the work was continued. This statement does injustice to the Pueblo Indians. The facts are that two months ago capitalists of Boston, New York and New Mexico purchased a great deal of land near the Rio Grande River. The lands are now valuable only for grazing purposes, but with irrigation their value would at once increase many fold. The syndicate purchased the charter of the Rio Grande Irrigation and Colonization Company and prepared to issue $3,000,000 first mortgage bonds on their property, to run twenty years at five per cent interest, the proceeds to be applied to building 200 miles of canals sufficient to irrigate over 2,000,000 acres. The company announced their intention to give the citizens along the line, including the native Mexicans and Indians, the refusal of all contracts and labor on the big canal at the same price at which the work could be done by other labor. But by some misconstruction of orders the superintendent ignored the claims of the natives and employed railroad graders to commence the work, and this is the only reason for the opposition of the Indians. All the company has to do to conciliate the Indians and go on with the work peacefully and successfully is simply to do as they promised by the Indians. There is no question about the success of the scheme if honestly and intelligently managed. It is well known that the Pueblo Indians have ever been friends of the whites, and that they have been making their living for hundreds of years by stock-raising and cultivating the soil. — *New York Sun*.

THE LATE GEORGE CLARK, ARCHITECT. — Mr. George Clark, a native of Bristol, England, died yesterday morning of old age at the Church Home, North Broadway, aged eighty-nine years. He was an architect and was for forty-three years with Sir Gilbert Scott, the most famous ecclesiastical architect of his day. Mr. Clark superintended the decorations and arrangements of St. James's Palace on the occasion of the first ball ever attended by Queen Victoria. As superintendent of construction for Sir Gilbert Scott he had charge of work on the royal palaces at Windsor, Frogmore, Buckingham and St. James. He rebuilt the cathedrals at Chester, Lichfield, Ripon and abbey churches in Yorkshire, at Croydon in Surry, New Castle in Staffordshire, St. Johns, Leicestershire and over forty churches elsewhere. Among the many private residences he built were those of the duke of Buccleugh, the duke of Cadogan in Pall Mall and of Sir Asheton Smith in Hyde Park Gardens. The old gentleman took much pride in speaking of his architectural work and of his contact with and rubbing against royalty and the peerage. Among the pleasant incidents he related was an occurrence at Frogmore, the royal residence of the Queen and Prince Consort in their early married life. When work on the palace was completed "rearing" flags were hoisted and displayed from the tops of all the chimneys of the palace. Prince Albert sent for Mr. Clark and inquired what it meant. He was informed that it was a signal that work on the palace had been completed and the workmen expected a treat, whereupon the prince instructed Mr. Clark to have the foreman allow his men a holiday and gave all a bountiful English dinner. He leaves one daughter, the wife of Mr. Crook, late organist at St. Paul's Episcopal Church in this city. — *Baltimore Sun*.

MUD DOCKS AT VIZAGAPATAM. — When a ship is to be docked at the port of Vizagapatam, she is, says *Indian Engineering*, towed up the river from her moorings to near the dock-yard. A large ditch of a little more than the ship's length and breadth, and deep enough to contain water of the depth of the ship's draught is dug in the mud at right angles to the river. At high tide the water flows into this ditch and forms a basin into which the ship is floated or dragged. Two rows of strong stakes are now driven in across the entrance to the ditch and common palmyra, date or bamboo mats tied to them. The space between these is filled up with sand and silt, and thus communication is cut off between the dock and the river. The basin in which the vessel is now floating being surrounded by a high mud bank formed by the mud excavated from the dock, the level of the water in the basin is raised by coolies throwing some of the mud of this bank into the basin, and thus raising the bottom of the basin which must in consequence elevate the water in the basin and the vessel floating on it. The vessel

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is by this process elevated considerably higher than the level of the water in the river or inlet. If the bottom of the ship requires much repair and has, therefore, to be elevated more than usual more earth is dug up and heaped high against the sides of the vessel leaving two or three yards of space in the dock unfilled fore and aft, and then water conveyed thither through a small channel is baled into the aforesaid spaces. This water also enters under the vessel and elevates it to the height of the mud heaped against it on either side. Strong beams of wood are by the following process next placed transversely under the ship at two, three or four different places varying according to the length of the vessel. At the spot where the beams are to be placed, what is called a mine (ghanee) is dug under the vessel from side to side, coolies working from either side of the ship at the same time until they meet each other under the ship's keel. Three beams, one after the other, are then dragged by a rope tied to the end of each under the keel and laid there one by the side of the other. The same thing is done fore, aft and midships or in more places if necessary. The mud on the sides of the vessel is then dug away to the level of the surrounding ground and the sides of the vessel caulked or otherwise repaired. After this is done — or simultaneously, if the vessel is to be repaired quickly — the mud under the bottom of the vessel is excavated except near the beams and the ship's bottom repaired: and the beams also if necessary are removed from one place to another to allow repairs where they were originally placed When the ship's bottom is under repair, several props consisting of the stumps of palmyra trees are placed against or slightly under the vessel to prevent her from rolling to a side. Ordinarily four sets of hawsers are used for undocking the ship after repair, each being coiled into the shape of a cone, the diameter of which at the base is about five or six feet, and where it touches the vessel a foot or two less. As the coiling is going on the cone is made solid by filling it in with mud. One cone is placed under the starboard bulge forward, another under the same bulge aft, and a third and fourth in corresponding positions on the larboard side. Four cones are ordinarily used at this port unless the ship is of more than 300 tons burthen — when their number is increased according to the length and size of the ship. After this is done the transverse beams are one by one withdrawn, the dock having been first dug to the required depth, and then the vessel, which now entirely rests on these cones, is gradually lowered by withdrawing simultaneously from the base of each cone a coil or fake by which the four cones supporting the vessel bodily subside at a low speed and the vessel along with them. The crossbund being now removed the water from the inlet flows into the dock and floats the vessel at high tide. The docking and undocking of a vessel of 200 tons ordinarily cost about 50 rupees [$350.] including the rent of the dock and the props and beams; and the cost increases in proportion to the size of the vessel and its draught. Vessels of 400 or 500 tons burden have been built and undocked at Vizagapatam in the manner set forth above, such as the "*Gallant Neil*," the "*Lady Sale*," etc. If on account of any extraordinary season a sufficient quantity of water does not flow into the dock, which is very rare, four or five large casks rented or belonging to the vessel are tied fore and aft at low water, or if large casks are not procurable a large boat or canoe is tied on, when filled with mud, and this mud being gradually removed the rising of the canoe or boat helps in setting the vessel afloat.

Electric Railways. — We are in receipt of information showing that there are now in operation in the United States and Canada 102 electric railways, the total mileage of which is 552 miles, and the total number of motor cars 839. This, says the New York *Electrical Review*, shows an average of about five and a half miles and eight cars for each road. But the list referred to gives in detail the cities and towns in which all the roads are run, and the number of single-track miles and the cars employed in each. The following analysis of the list will furnish an interesting exhibit of the present situation of this important matter:

ROADS IN CITIES OVER 100,000 POPULATION.

	Miles.	Cars.
New York	18.5	10
Boston	14	31
Albany	15.5	16
Cincinnati	12	31
Cleveland	30	60
Louisville	10	10
Detroit	7.5	6
St. Louis	5.5	12
Washington	3	10
Baltimore	2	4
New Orleans	—	1
	118	191

CITIES OVER 25,000 AND UNDER 100,000.

	Miles.	Cars.
Rochester	7	9
Syracuse	4	8
Troy	5	12
Columbus	2	2
Dayton	9	12
Nashville	3	6
Harrisburg	7.5	10
Lynn	6.8	9
Plymouth	4.5	3
Wilkesbarre	3	8
Wilmington	3	8
Omaha	26	72
Richmond	13	41
Wheeling	10	5
Erie	12	5
Reading	2	4
Scranton	20.5	37
Davenport	3.5	6
Des Moines	10	8
Salem, Mass	2	6
Atlanta	4.5	4
Allegheny	3.7	6
	162	281

The Palace di San Giorgio, Genoa. — The local Archæological Committee of Genoa has decided to preserve the historic and artistic Palace di San Giorgio, or del Capitani del Popolo, threatened with demolition. The palace was built in 1260 by the Capitano del Popolo, William Boccanegra, under the direction of the Monk Oliviero. It is a rare example of the Lombard architecture in Liguria in the thirteenth century. — *Exchange.*

TRADE SURVEYS

Reports from 100 railroads for eleven months last year show an increase in net earnings amounting to $25,000,000 in round figures over the same mileage for 1888. The earnings of railroads for November also show an extraordinary increase. December earnings, so far as reported, show up remarkably well. Railway managers everywhere count upon a very heavy traffic throughout this year. It is said that there is no danger of damaging rate-wars, but the people doubt. Cutting is already going on on several Northwestern roads on some classes of freight; but at the trunk-line meetings recently held, the disposition to make necessary concessions has been manifested. The stock-markets in the leading cities of the country are, from a stock standpoint, very unsatisfactory. Speculation is dormant, but the controlling spirits are making all the preparation they know how to make for a general upward movement. The future of railway-building in this country is still clouded in doubt; but even if so the projection of new roads continues, and when the time comes — whenever that may be — there will be a great revival in railroad-building. A recent estimate of projected railway mileage places the paper-built roads at over 20,000 miles. Some of these enterprises are two or three years old. The fact that one-fourth of the railway mileage of the country has passed under the hammer within twelve or fifteen years acts as a check upon enterprise; but with all the discouragements which railway builders and managers have encountered, there is a reckless anxiety to begin construction on a large scale and upon a very small pretence. The railroad-building situation is somewhat contradictory. Control is gradually passing into fewer hands. Years ago, when feudalism in railway management prevailed, much ill-considered work was done, and the foundation laid for a great deal of subsequent quarreling. With the elimination of this element of evil a foundation is being laid for future harmony. The managers of the larger systems throughout the country are endeavoring to quietly and indirectly check the promotion and inauguration of new enterprises, with a view of, at the proper time, supplying all needed facilities within their respective territory, and the legislatures of the Western States and the railway commissions are also unintentionally and unwittingly maintaining a great deal of opposition to new railway enterprises. The Nebraska railroads have been told to reduce freights on corn, in order that the farmers may have more margin. The Iowa railroads expect similar instructions. The agricultural interests generally throughout the West manifest a determination to keep railroad managers under close surveillance. The condition of banks in Eastern cities is improving. At New York the reserves are $8,000,000. Financial interests anticipate a demand for gold from London. The export of provisions, cotton, etc., for 1889 was $101,000,000 in excess of 1888. There is an extraordinary demand for money in British and Continental centres owing to the legitimate expansion of trade in all directions. The present weekly output of pig-iron in the United States is 175,000 tons, an increase of 40,000 tons per week as compared to six months ago, or about at the rate of 2,000,000 tons per year. The expansion of pig-iron-making capacity was never pushed as rapidly. Soft steel is in urgent demand.

The agitation in favor of the inauguration of an eight-hour strike has received considerable encouragement among workmen in a few of the larger cities of the country, and it is stated that Pittsburgh will be made the battleground for the movement next spring. This indicates weakness upon the part of the workers. Pittsburgh has won many labor strikes, but they were fought by iron-workers, who possessed exceptional advantages for the maintenance of the contest. The master-builders will boldly meet their workmen in this and any other contest which may be made. Manufacturing interests are straining capacity in every branch of production to meet accumulating demand. Late advices from machine-shop managers in most of the Northern States throw light upon trade conditions in the smaller industries. The extraordinary demand for machinery, tools and equipments is spoken of by nearly all engaged in these branches. In the mining of the coal there is fair activity in all excepting anthracite, and in that branch there are from 10,000 to 12,000 cars now loaded in Eastern Pennsylvania, besides unprecedented supplies at all distributing points. In the far Western States, the local demand for fuel is enabling the small mine-owners to run their mines full time. The lumber interests are unable to prosecute lumbering operations to the usual extent at this season, owing to unfavorable weather. The supply of lath is low, and the over-stock of shingles is not heavy. The extraordinary demand for lumber in the South points to stronger prices for Southern lumber in Northern markets next spring; but, to protect themselves against such a possibility, many Northern dealers have already made contracts with Southern mills at current rates for ample supplies. In the smaller industries there is great activity and full prices. Our boot and shoe manufacturers are quite busy. Our paper manufacturers complain of weakening prices in some lines, but capacity has been so greatly increased within the past few years that such a result is not surprising. In writing-papers, capacity is being restricted. Shelf-hardware manufacturers in the New England States have been successful in maintaining almost unshaded quotations for months past. Barbed-wire is very active; wire and cut nails are selling well, and all lines of goods coming under the general head of hardware are meeting with good sale. The stove-moulders have had a very good season. The builders of gas-engines find the demand for their specialties increasing. The manufacturers of small machinery and small engines are sold up for two or three months. Quite as favorable reports come from the largest manufacturing concerns, employing from 1,000 to 2,000 hands. Whatever latent evils may threaten industrial activity, there are no symptoms at present which are calculated to disturb the serenity of manufacturers. The possibility of labor agitations is the most prominent of the undesirable possibilities; but employing interests have had sufficient notice of the contemplated disturbance, and much preparation is being quietly made to ward off the danger where fair dealing and conciliatory measures are likely to avail. Strong and stronger prices are likely to prevail in nearly all lines of trade during 1890, and special inducements to enter trade and manufacturing will entice in thousands whose experience will probably be brief.

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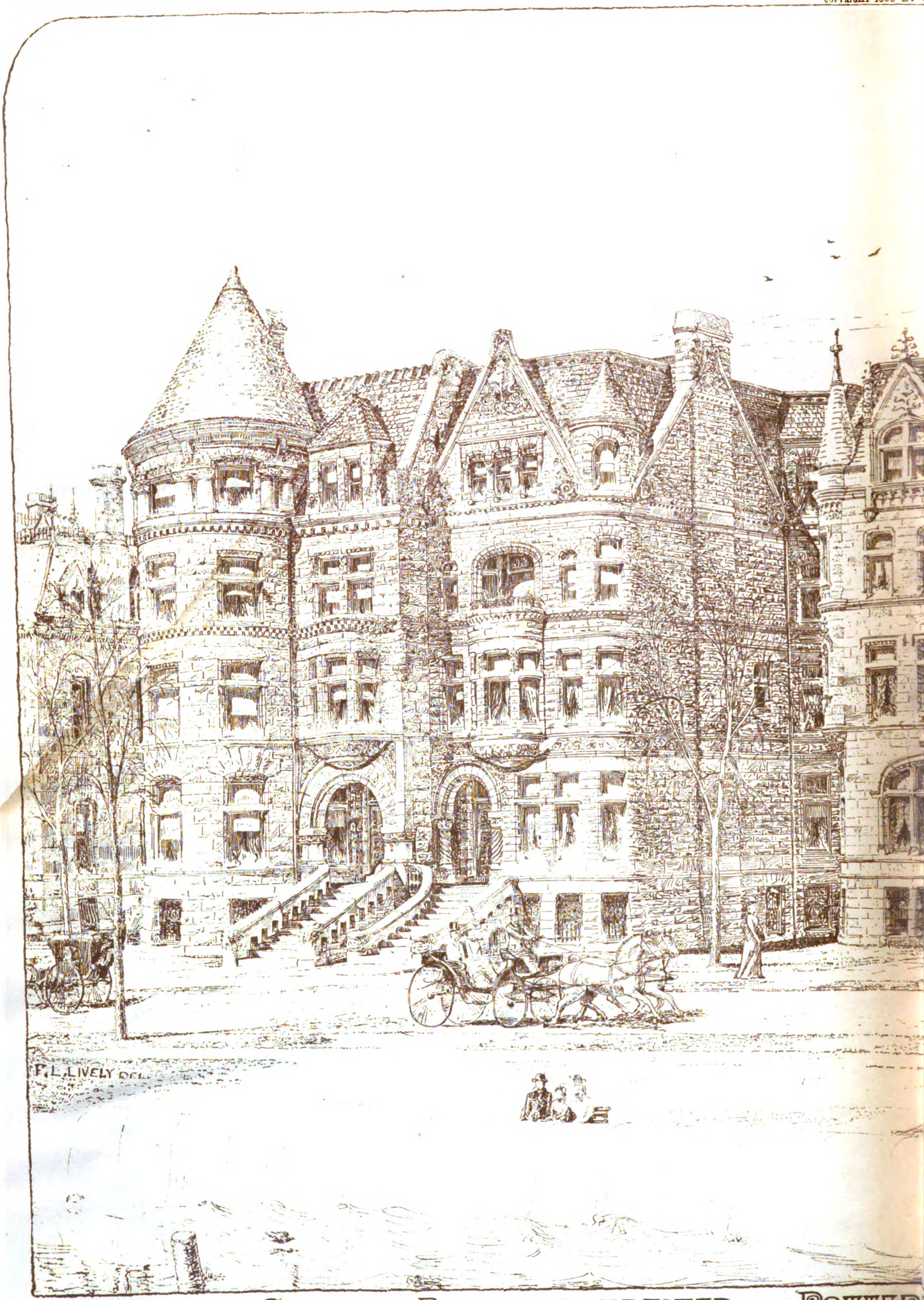

1889. GROUP OF BUILDINGS ERECTED FOR POTTER

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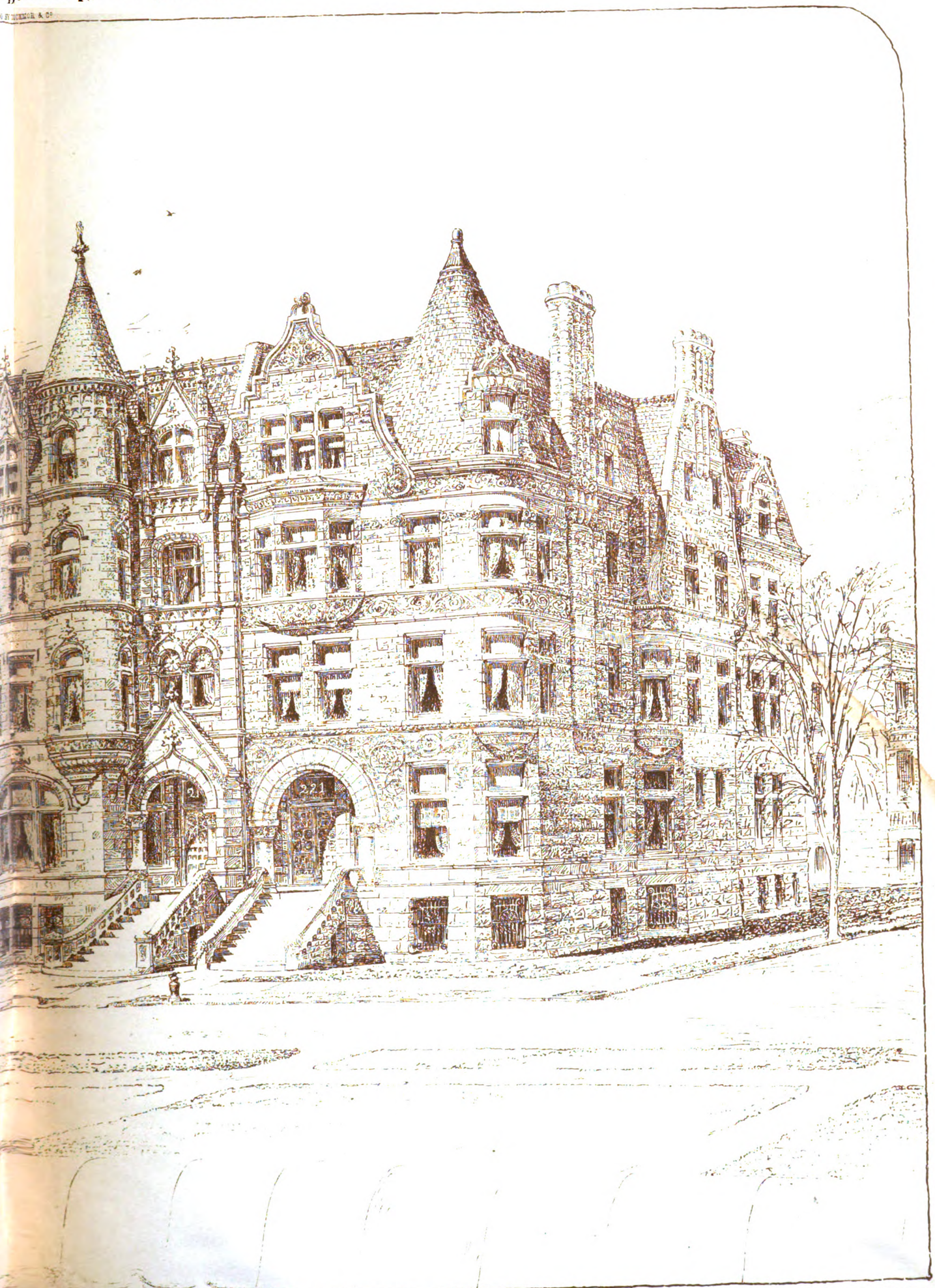

PALMER on LAKE SHORE DRIVE CHICAGO. E.M. PALMER ARCH'T.

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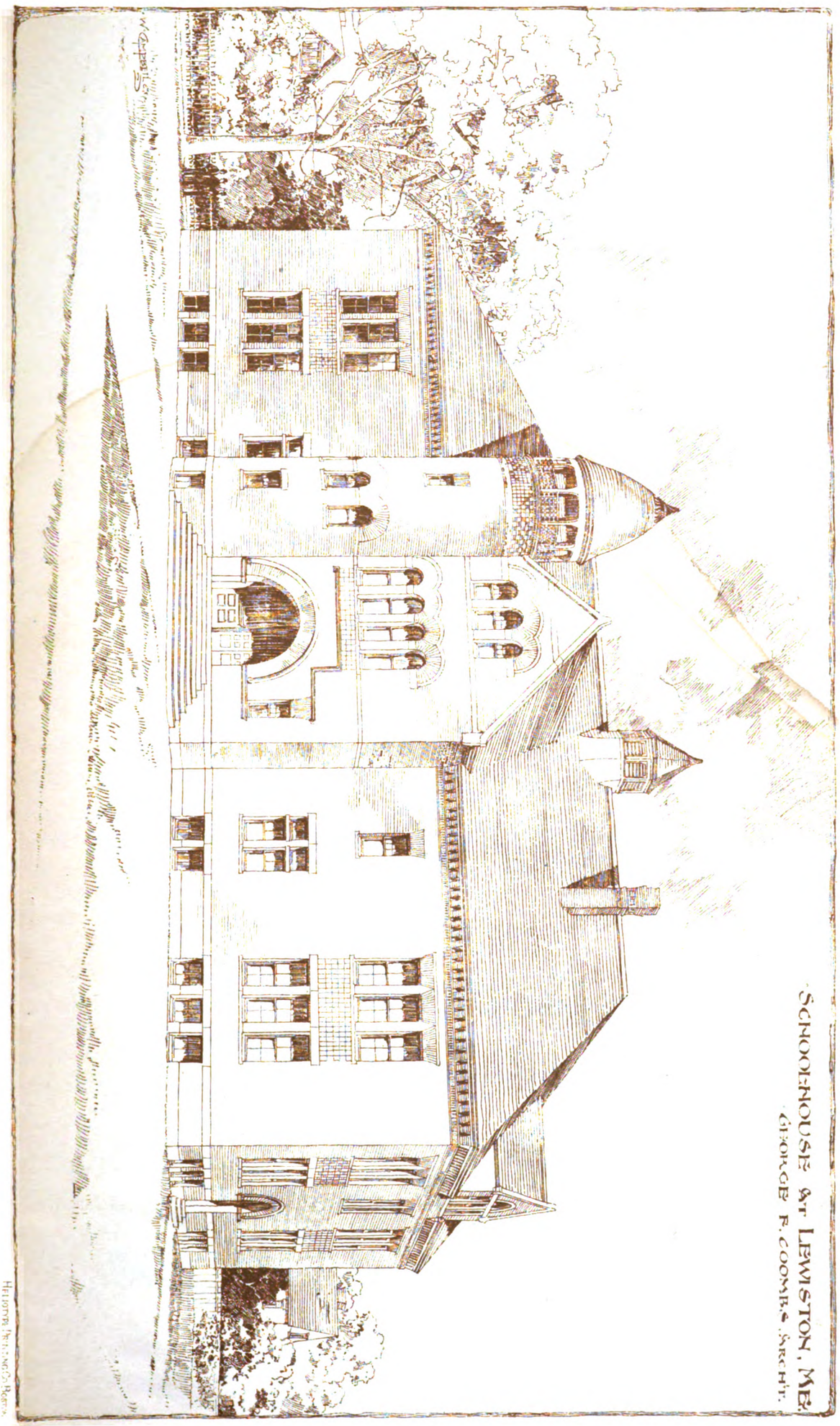

SCHOOL-HOUSE AT LEWISTON, ME.

GEORGE F. COOMBS, ARCHT.

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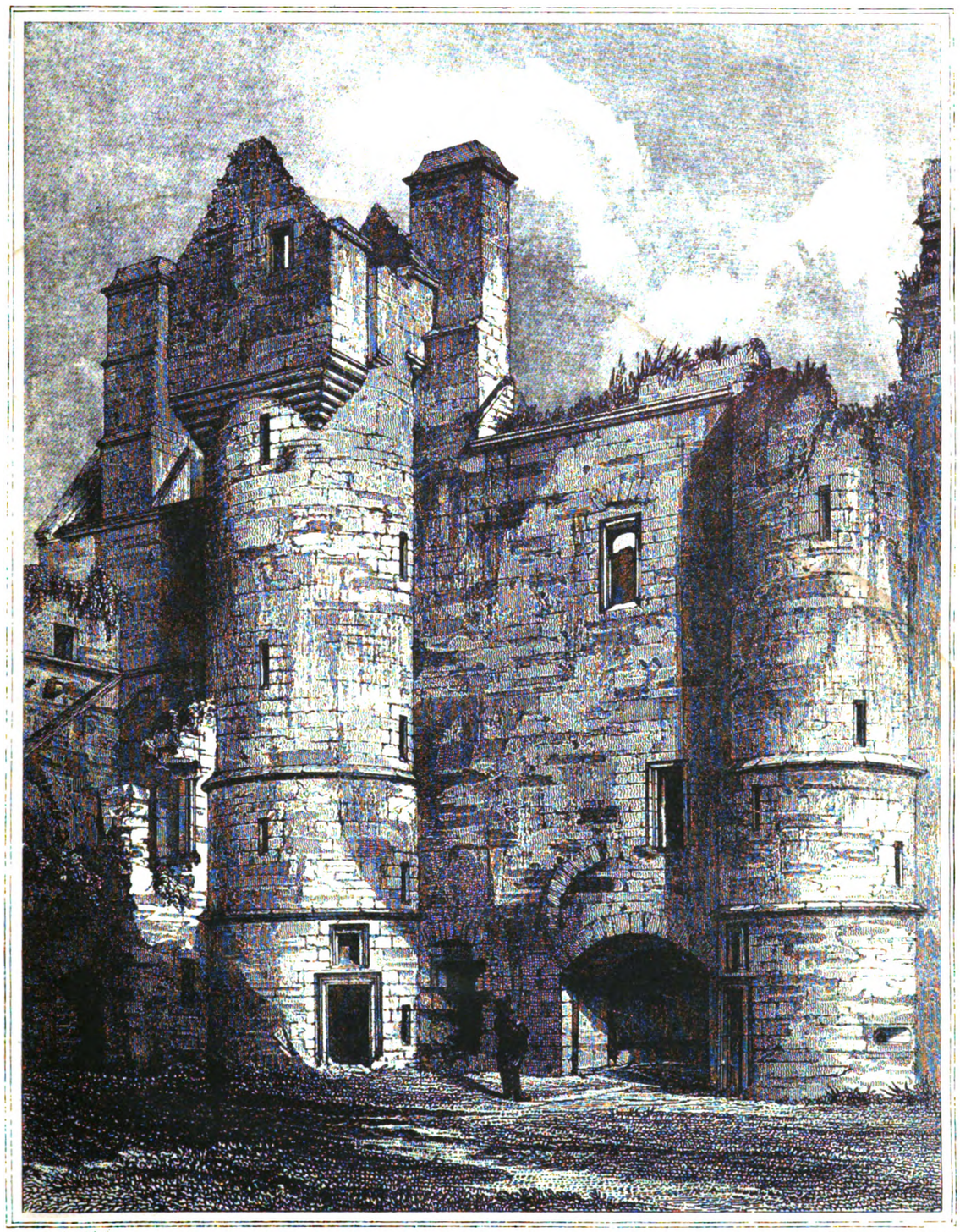

THE COURT YARD OF BALVENY CASTLE.

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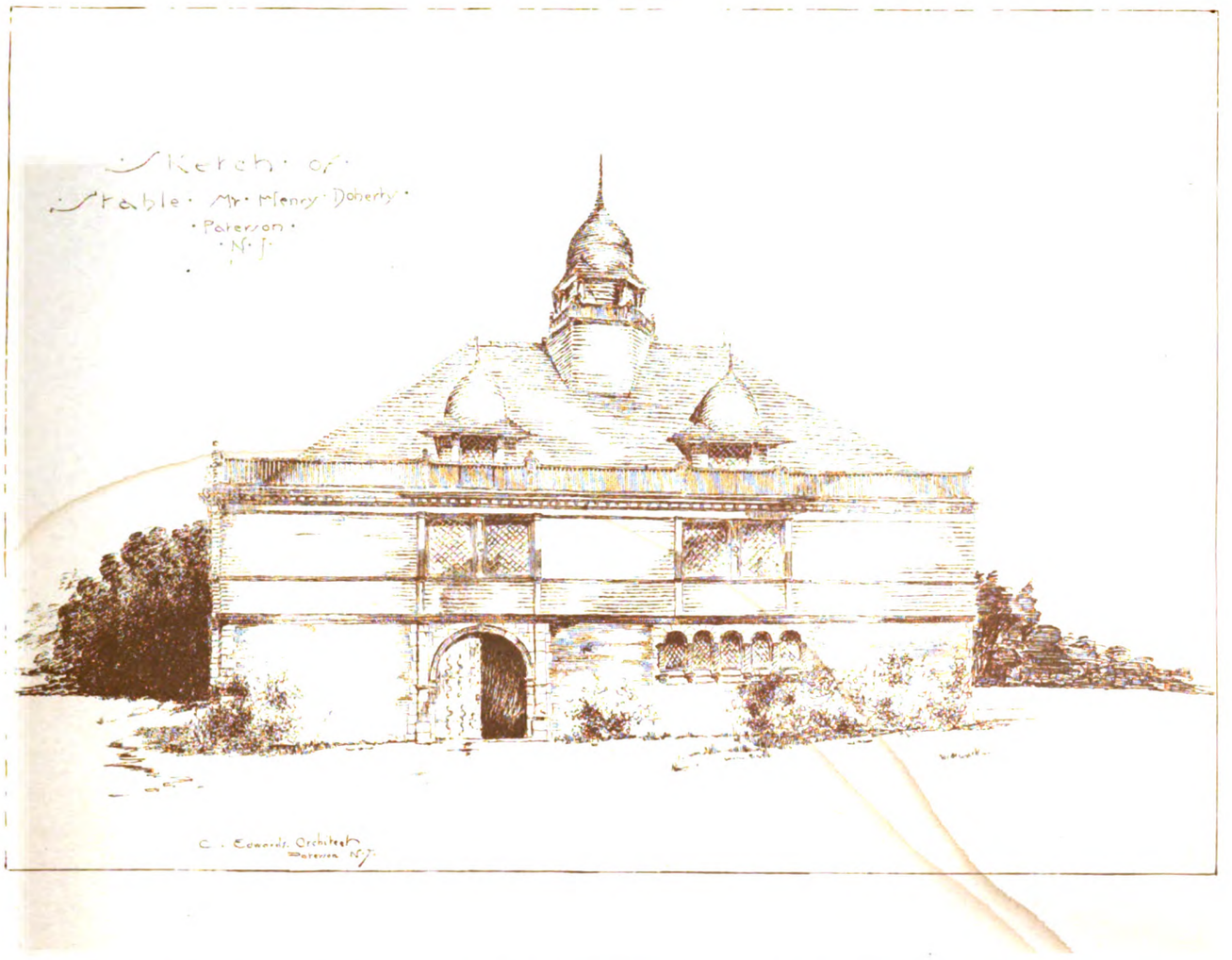

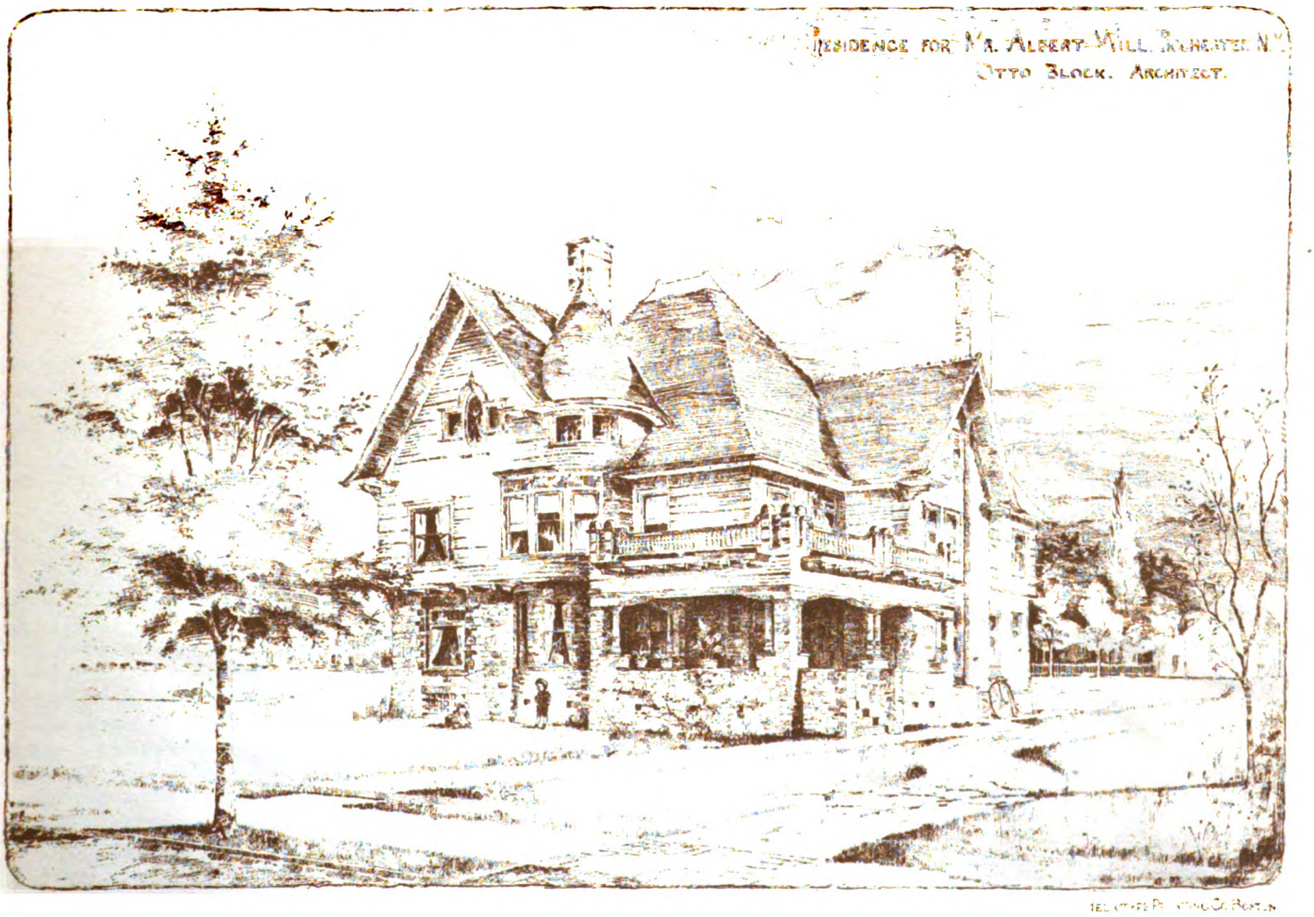

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WE endeavored to make it plain that if subscribers wished to have the International edition for 1890 in its completeness, they should make their wishes known in time for us to make our edition of the proper size to fill all demands. In spite of this, we find, now that the enterprise is launched, that many who then hesitated now desire to receive that edition. We have, therefore, increased the edition, and, as the imported plates cannot be replaced, we are now engaged in reprinting them on this side of the water. The results will, of course, be slightly inferior to the originals, but they will, at least, enable a subscriber to have his file complete from the beginning.

MR. GIBSON'S letter in our last issue brings up a point which ought to be settled before any more invitations for public competitions are issued; that is, the meaning of the expression "black-lining." Mr. Gibson says that he, with several others, understood that the restriction that the perspective should be "without painting or shading other than black-lining" meant that such shading would be allowed as could be done with black lines. It is quite possible that this is the correct interpretation, but it is also certain that many of the competitors understood the programme to mean that no indication of shadow would be permitted except that which is given by making the outlines on the side toward what might be a shadow wider than those on the side toward the assumed light. This method of "black-lining" or "back-lining," as we have heard it called, gives a certain appearance of relief, and is still much used by engineers, particularly in machine drawing, but it is nearly obsolete among architects, who dislike the uncertainties of scale introduced by the thickening of the lines. To our mind, the expression, which has appeared in several recent competition programmes, would be best left out altogether. If full pen-and-ink rendering is wished for, it is easy to call for shaded drawings in pen-and-ink, but if only outline drawings are desired they should be so described, without saying anything about black-lining, or, if that is wished for, it should be explained so that there will be no possibility of mistake.

THE daily papers say that the American School of Archæology at Athens, which obtained from the Greek Government the privilege of buying the site of the temple at Delphi, on condition that the necessary money, seventy-five thousand dollars, should be raised within a limited time, has been unable to secure subscriptions to the required amount. The money is not demanded as the price of the land, but is needed simply to pay the poor people of the village of Castri, which stands in what was once the sacred enclosure, for the loss of their houses, which must be removed before excavations can be begun. With great courtesy, the Greek Government has extended the time of payment to June 1 next, but the subscription-list grows very slowly, and there is little hope of raising the money. It would be a very great misfortune to the cause of art, as well as learning, to have this opportunity neglected. During nearly half the period known to history, Delphi was the centre of the earth, the *terræ umbilicus* of the Romans, and the priestess who, under the inspiration of the vapor from Apollo's cave, delivered its sacred oracle, exercised an authority over the ancient world to which even the influence of the Popes in the Middle Ages bears no comparison. Œdipus, before returning to Thebes; Theseus, before sailing with the seven Athenian youths to be sacrificed in the Labyrinth to the Minotaur; Jason, before embarking with his Argonauts to bring back the Golden Fleece; Lycurgus, before undertaking to draw up the Spartan code; Themistocles, before Salamis; and nearly every hero and general of antiquity down to Julian the Apostate, besides deputies from towns and cities on all sorts of occasions, consulted the Delphian oracle, and left in the temple, in acknowledgment of the divine counsel, gifts proportionate to their means. Theseus, according to the legend, cut off his hair and left it there, as the only thing he had to give, and the most precious objects of Greek art must, from the earliest ages, have been collected in vast quantities in the building. It is true that the temple was repeatedly plundered and burnt, but the fact that the Phocians once made a requisition on it of ten million dollars, and that Nero, long after the commencement of the Christian era, carried away from it more than five hundred bronze statues, shows the enormous accumulation of valuable objects, many of which would, by the burning of the structure which sheltered them, have been covered, and thereby protected, even from the most eager plunderers. Upon the ruins of the successive temples now stand the huts of Castri, and we might almost say that Greek history lies beneath. Of all the places where archæological research is possible, Delphi promises the most intensely interesting and splendid results, and it would be a thousand pities to allow the honor of bringing them to light to pass out of American hands for want of a much smaller sum than many Americans have paid for a single picture. We cannot believe that our rich and intelligent men will suffer the opportunity to pass, but whatever is done must be done quickly, and we shall be very glad, if any one wishes it, to receive the names of subscribers, and see that they are properly added to the list. We presume that subscriptions for this purpose are conditional upon the pledging of the whole amount required before the expiration of the allotted time.

A CASE decided last month in the Tribunal of the Seine furnishes another warning in regard to the importance, for architects and builders, of having all agreements defined and secured by written contracts. A young lady in Paris, Mademoiselle Masson, member of a religious Community, and known as Sister Radégonde, inherited a considerable sum of money, and resolved to use a part of it for the benefit of the convent in which she lived. She wrote to the Superior of the Order to which she belonged, for permission to have the chapel of the convent completed at her own expense, and received the permission desired. She then applied to the architects usually employed by the Sisters of the convent, for plans, which they made. The work, apparently after tenders had been made in the usual form, was awarded by the architects to a carpenter, M. Jeannin, and a firm of masons, who were introduced to Sister Radégonde, and were informed by her that the work was done for her personal account, as a gift to the Community, and was to be paid for out of her own private fortune, which, as they knew, was ample for the purpose. The sacred calling

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of the lady apparently awed the builders, as well as the architects, to such an imprudent extent that no written contract was prepared, nor was even a memorandum of the lady's part of the agreement asked for; but the work was carried out on the sole security of her verbal promise. Unquestionably, this would have been kept to the letter, but before the building was finished, she was, unfortunately for the contractors, summoned to her heavenly reward among the saints, while her worldly affairs were left to be conducted by lawyers. By her will, all her property was left to Sister Marie, the Superior of her convent, but the French law — the statute of May, 1825, provides that no gift or bequest by a member of a religious community of women, either to the community or to any member of it, can exceed one-fourth of the property of the person making the gift, in cases where the intended gift would exceed two thousand dollars. Of Sister Radégonde's property, therefore, only one-fourth could legally go to her convent, and, as she had no known relatives to inherit the rest, it was handed over to a curator appointed by what answers in France to the Probate Court. When the work was finished, the builders and the architects presented their bills, amounting to over twenty thousand dollars, to the curator of their employer's property, who declined to pay anything. Sister Marie, the Superior of the convent which owned the newly completed chapel, also declined to pay anything, and suit was brought against both parties. Sister Marie, in the name of the convent, which perhaps had not received enough from the dead sister's legacy to meet the bills, asked the court to decide, on her part, according to pure and simple justice, and the judge ruled that the builders and architects had no claim against her or the convent. Mr. Hébert, the curator of three-fourths of the property, was altogether too good a lawyer to ask the court for justice, and based his refusal to pay a perfectly fair claim on the inability of the architect or the builders to produce a written order from Sister Radégonde to execute the work, or a written promise, signed by her, agreeing to pay for it. The French law in such matters is even stricter than our own Statute of Frauds, and as the claimants could not bring forward the required documents, they were all non-suited, and condemned to pay the costs. Even the letter of the Superior of the Order to Sister Radégonde, authorizing her to carry out the proposed work at her own expense, was rejected as evidence, on the ground that the Superior was not a party to the suit, and that, as in any case it only proved an intention on the part of Sister Radégonde, which might be changed at any time, it did not show an express and formal engagement toward the contractors.

A TEMPEST in a teapot has been raging for the past week or two at New Haven, in the Department of Mechanical Drawing attached to the Sheffield Scientific School. It seems from the newspaper accounts that Professor F. R. Honey, who has for several years been in charge of the Department, directed the members of his Freshman class, at the beginning of the course, to procure drawing instruments of a certain kind, which were kept for sale, presumably at his request, by a firm of dealers in New Haven. It is hardly necessary to say that the more perfect a Freshman's ignorance is of any subject, the less disposed he is to regard any one's advice in relation to it, but the request might have been complied with quietly, had not an enterprising Junior, who saw an opportunity for business in the matter, canvassed the class as agent for a Philadelphia firm of instrument manufacturers, and, as the goods which he offered were sold at a less price than the ones which the Professor had desired the class to buy, he secured many orders from the thrifty youths. When Professor Honey learned what sort of instruments had been purchased by a large part of his class, instead of those which he had specified, he gave orders that they should not be used for the work in his course, and, to enforce the order, gave notice that he should refuse to accept plates made with them. Thereupon ensued the most discreditable proceedings that we ever heard of in connection with any college. The Freshmen, united by their noble zeal, not for the defence of an accused classmate, as is usual in other college squabbles, but for the saving of their own precious sixpences, went to the Faculty, and, with a delicacy of feeling quite worthy of an institution for the training of peddlers, informed them that the reason why Professor Honey wanted them to use a particular sort of instruments, instead of the cheaper kind, was that he received a commission on sales of his favorite sort, while he could get none on the cheap variety. We have not been able to discover from the daily papers that the smallest ground existed for this very improbable assertion, but the Faculty, or whoever may have been in charge of the matter, were apparently panic-stricken, and Professor Honey was forthwith dismissed, while the triumphant Freshmen, with their cheap instruments, remained in possession of the field. Apparently no inquiry was made as to Professor Honey's reasons for preferring a particular make of instruments; as to the expediency of allowing beginners in mechanical drawing to become habituated to heavy, clumsy or ill-made tools, or as to the real merits of the two sorts; the fact, so far as we can judge from the papers, seems to be that on the simple application of a number of ignorant boys, accompanied by an assertion which, unless supported by either sworn testimony, or documentary evidence, ought to shut out forever both those who made it and those who listened to it from the society of gentlemen, a tried and experienced officer of instruction was thrust out in disgrace from the University, with no more of a hearing than is implied in the opportunity which is said to have been offered him to "retract." We do not doubt that in so business-like an atmosphere as that which appears to prevail in New Haven, the lesson will not be lost, and we shall see next, perhaps, the Professor of Music ignominiously superseded, for daring to object to the substitution of two-dollar fiddles, for which some undergraduate has the agency, for the more costly instruments which he has been accustomed to recommend to his violin classes; or the Football Professor marshalling his men in uniforms of rags tied together with strings, because a member of the University deals in "speculation" jerseys, and cannot, without great risk, be balked of an opportunity of selling them to the team.

L'ARCHITECTURE gives an interesting account of Baron Ferstel, of Vienna, one of the most distinguished architects of the century, who died about five years ago, after reaching the highest professional eminence. Ferstel was born in Vienna, and trained in the public schools, at the Polytechnic School, and, later, in the University, where he took the higher courses. He then entered the Academy of Fine-Arts, as a student of architecture, and, on finishing his course here, became assistant to his uncle, the architect Stache. While with him, he assisted in the design and execution of the altar of the chapel of Saint Barbara, in St. Stephen's Church, and, soon after, entered on his own account the competition for the Votive Church, which was to be built, by popular subscription, in commemoration of the escape from assassination of the Emperor. The Archduke Maximilian, who was later to meet a violent death as Emperor of Mexico, was the principal promoter of the scheme for the church, and an immense sum of money was raised. After sending in his plans, Ferstel, who had just been awarded a travelling-studentship, went to Italy, and while at Naples received notice that his design had been placed first in the competition, and that he was to be the architect of the Votive Church. He was then twenty-five years old. The actual construction was not begun until three years later, and Ferstel had plenty of time to perfect his drawings for the building, which at once gave him a place among the most prominent architects in Europe. He was soon employed in other important work. While the Votive Church was going on, he built a beautiful Protestant church at Brunn, in Moravia, and was appointed architect of the National Bank, the Chemical Laboratory of the University, and the Museum of Arts and Manufactures. The Polytechnic School chose him as professor, and afterwards as rector, and the Emperor made him a baron, while nearly every professional society, including our own Institute of Architects, was proud to have him as an honorary member.

THE St. Louis Academy of Music, which had been so far completed as to have the roof in process of making tight, collapsed not long ago, while fifty men were at work on it, and the walls fell into the cellar, burying eight of the workmen. The crash was a rather leisurely one, the fourth story falling first, followed by the third, and this by the second, and so on, most of the men being thus enabled to scramble to a firm portion of the building. The cause of the accident is said to have been the movement of a vein of quicksand under the foundations.

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CIVIL AND DOMESTIC ARCHITECTURE.[1] — IV.

WHILE civil architecture was thus springing into life and vigor in France, neighboring countries were not idle. In Italy, Germany, Belgium and Holland, a large number of public edifices and private dwellings were built. In England and Holland, at Amsterdam, Antwerp and London great exchanges, genuine basilicas, were erected for the accommodation of merchants. They consisted of extensive porticos running around a court, with covered galleries above; a clock-tower, the appendage of every municipal edifice, was joined to the structure. In England, also, the Universities of Cambridge and Oxford, Windsor and Norwich Castles, and the great hall of the King's Palace at Westminster were constructed: they were all in mediæval style. After the return from the Crusades, and after a long period of Byzantine influence, we find societies of free-masons in Germany setting aside Oriental traditions and adopting forms better suited to the climate and resources of the country. It was at that time that so many town-halls, like the one at Lubeck, were built, and the many belfries, exchanges, slaughter-houses, *entrepôts* fountains, hospitals and bridges [bridges of Lucerne,

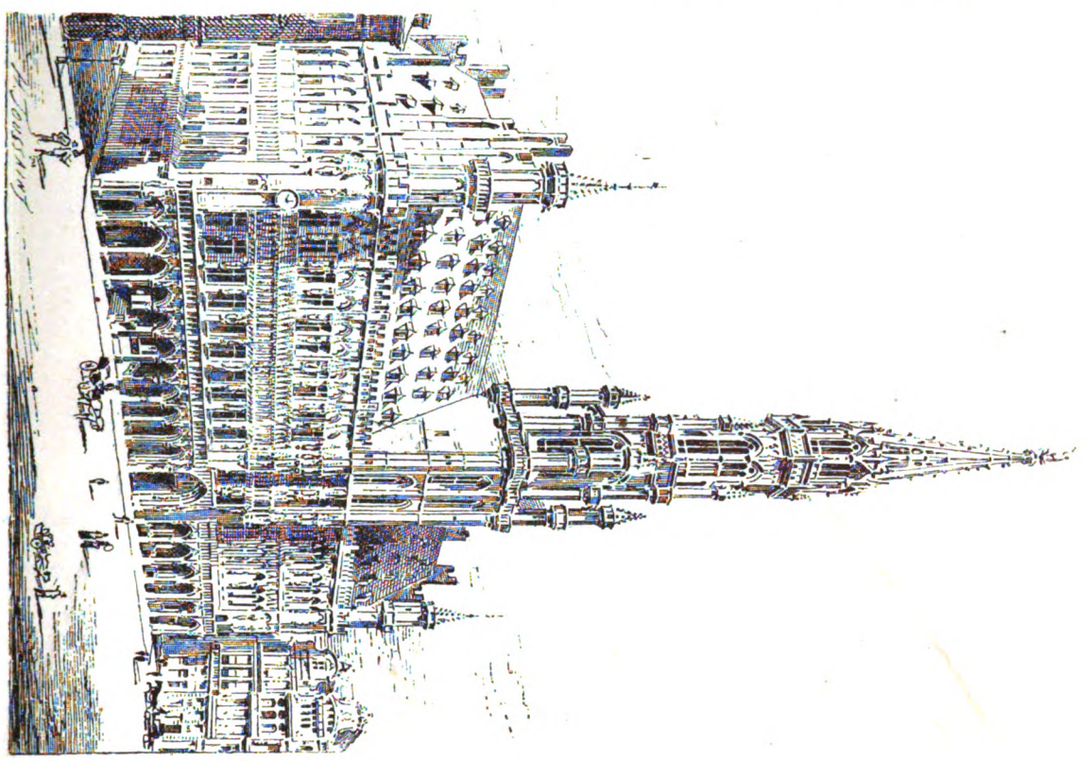

Fig. 13. Hôtel de Ville, Brussels.

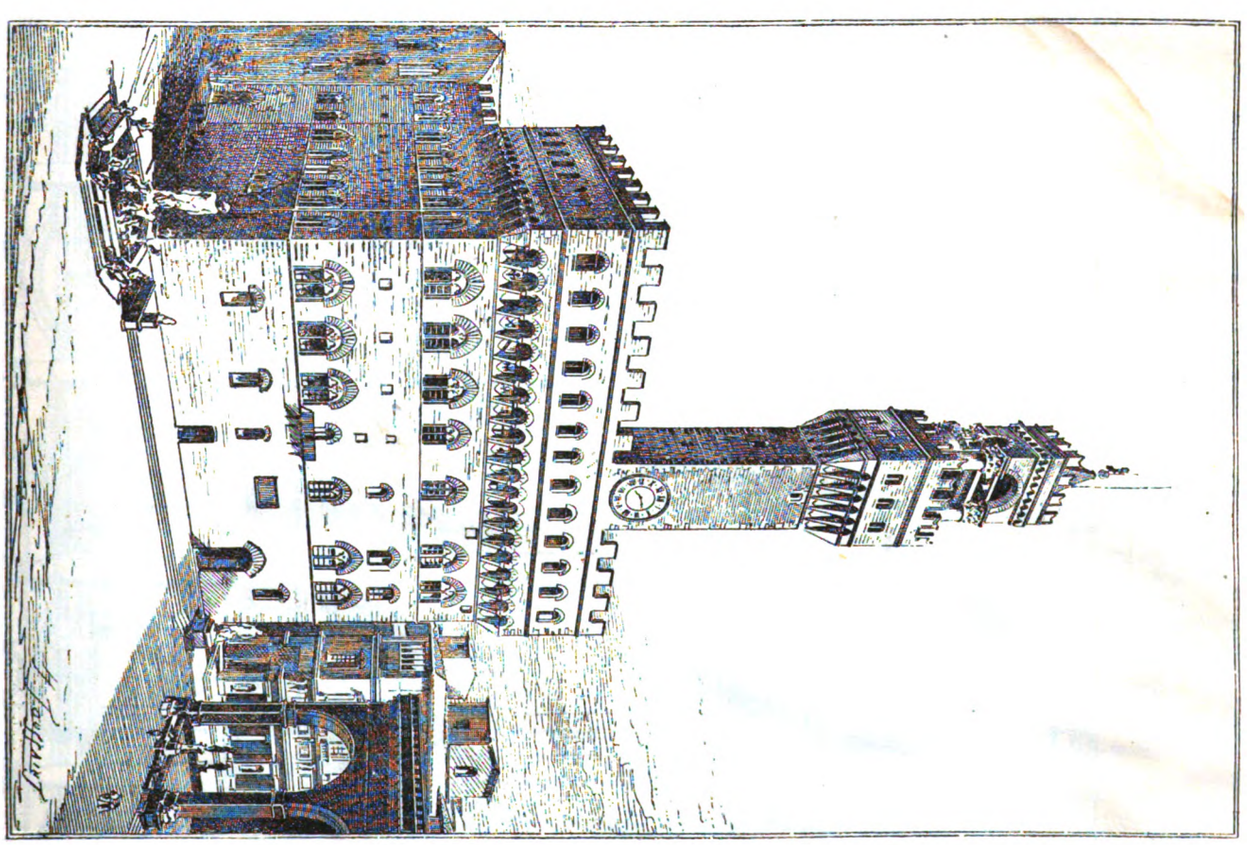

Fig. 14. Palazzo Vecchio, Florence.

[1] From the French of G. Guicestre, in "*Encyclopédie de l'Architecture et de la Construction.*" Continued from No. 735, page 53.

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Ratisbon, Dresden, Prague]. In Belgium, likewise, a large number of exchanges, belfries and town-halls were built. The exchanges of Bruges and Ypres, and the town-halls of Brussels (Figure 13), Saint Bavon, Louvain, Mons, Courtrai and Audenarde are noteworthy examples.

The Latin style prevailed in Italy until the eleventh century, becoming allied with the Byzantine, a new style was produced, the Romance, sometimes termed the Byzantine Romanesque, and public palaces sprang up in all the cities, modelled after the same general design: there was always a square court surrounded by buildings, of which a portico formed part of the ground-floor; the assembly-halls above were

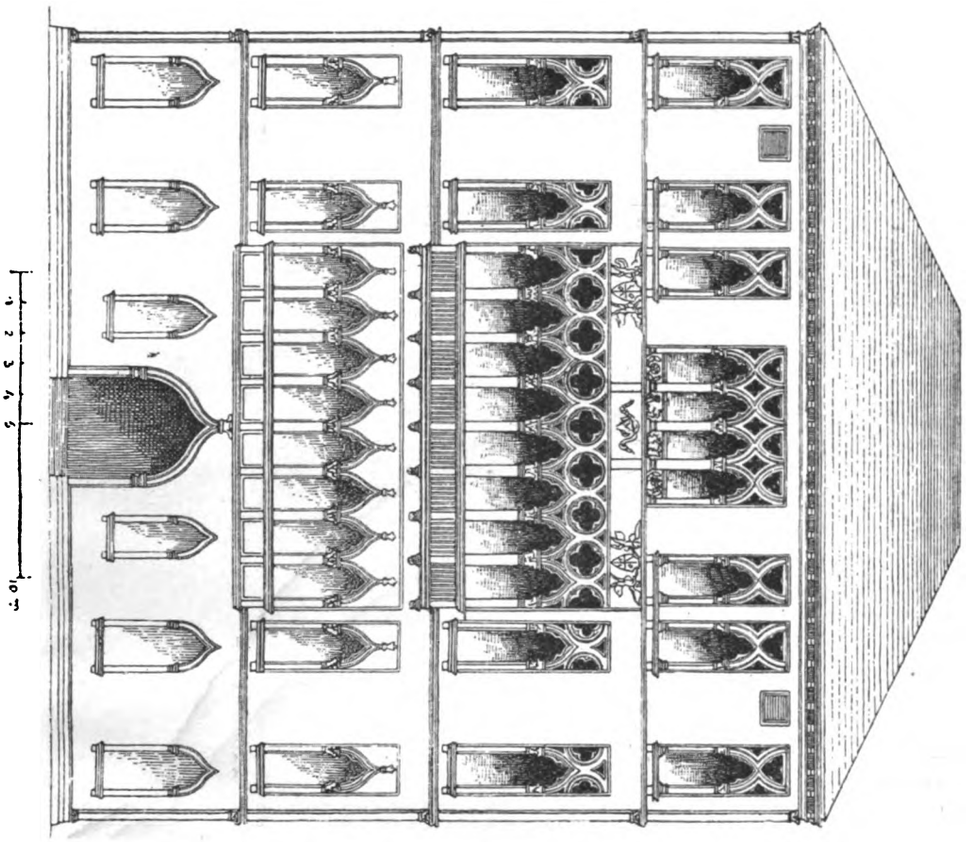

Fig. 16. Foscari Palace, Venice.

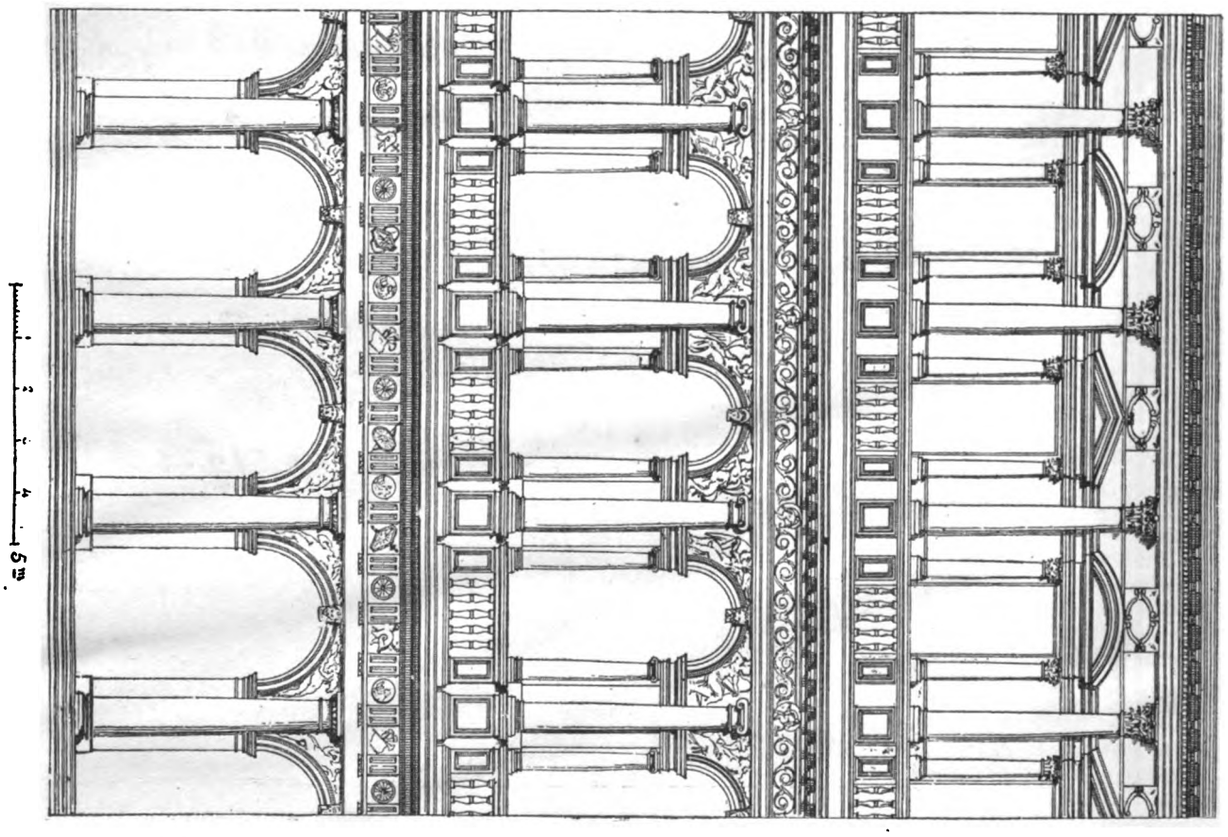

Fig. 17. Procuratie Nuove, Venice.

and down to that period, as was the case everywhere else in Europe, architectural activity was confined to the erection of houses of worship for the new religion. Then, however, civil architecture awoke from its torpor. The Latin element lighted through broad windows. The municipal palaces and even the mansions of the rich citizens were fortified and embattled. The rivalries existing between different cities, and the frequent struggles between hostile parties of the same

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city made these fortifications imperative. The old palaces of Florence, Verona and Vicenza, the ducal palace of Ferrara, the palace of Eccelino, at Padua, the château Delle Torri, at Turin, all presented the aspect of strongholds. The Pointed (*ogival*) style made its appearance in Italy at the end of the thirteenth century introduced by German artists, but it was adopted only with reluctance. The Palazzo Vecchio (Figure 14), the Loggia dei Lanzi, at Florence, the Doge's Palace in Venice, and the loggias of the public palaces at Padua and Sienna were built in this style.

Italy, in the fifteenth century, was the first to break away from the Pointed style and go back to antiquity for proportions, profiles and decoration. During this period of the Renaissance a tremendous impulse was given to private construction. All over the cities of Tuscany palaces were built with the apartments disposed around an inner court decorated with porticos. Life, however, was no longer wholly confined to this court: windows were opened on the street, though these were quite unimportant in the lower story, and were pierced only at a certain height, but on the other floors they were very broad; especially was this the case in the reception story, the first above the ground-floor. Such palaces are the Pitti, Riccardi, Tornabuoni, Cafareggi and Strozzi (Figure 15) at Florence; very beautiful ones were also built at Sienna and Urbino. Then from Tuscany the new style spread widely, continually losing more and more of its mediæval characteristics. In Venice the Contarini, Foscari (Figure 16), Vendramin, Corner and Camerlenghi palaces, the Library of St. Mark's, the Procurazie, *vecchie* and *nuove* (Figure 17), the inner façade of the Doge's Palace and the Giants' Staircase were constructed, all most richly ornamented. At Milan less showy palaces — among others the Castiglione — and a lazaretto were erected.

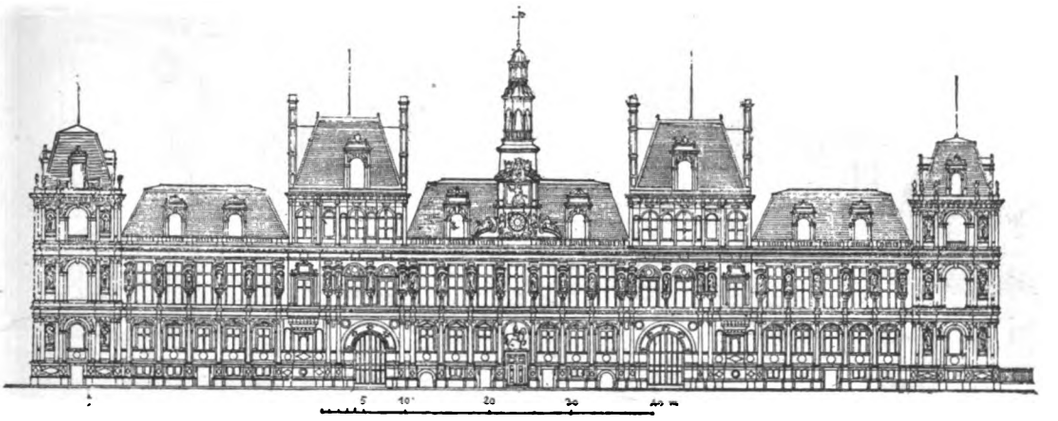

Fig. 18. Hôtel de Ville, Paris.

Lastly, the most perfect expression of the Classical Italian style of architecture is to be found in Rome, in the palaces of the Cancellaria and in the Giraud, Farnese, Chigi, Massimo, Berti, Vidoni and still other palaces.

The Renaissance afterward passed into France, encouraged by kings who had been captivated by its charms during their Italian campaigns. Here, however, it was at first applied to the re-dressing of façades, the disposition of the plans being in no way modified. Broader openings were made in castle-walls, and sun and light were admitted into them through ample windows richly framed in the new style; but the halls were still arranged one after another, without any well-defined destination and without separate entrances. The houses of the *bourgeoisie* were not altered in structure. There were, moreover, no social modifications to call for new architectural designs; the old ones were merely developed and clothed in different forms. The principal constructions of this period were palaces and castles. In the Château d'Amboise the first

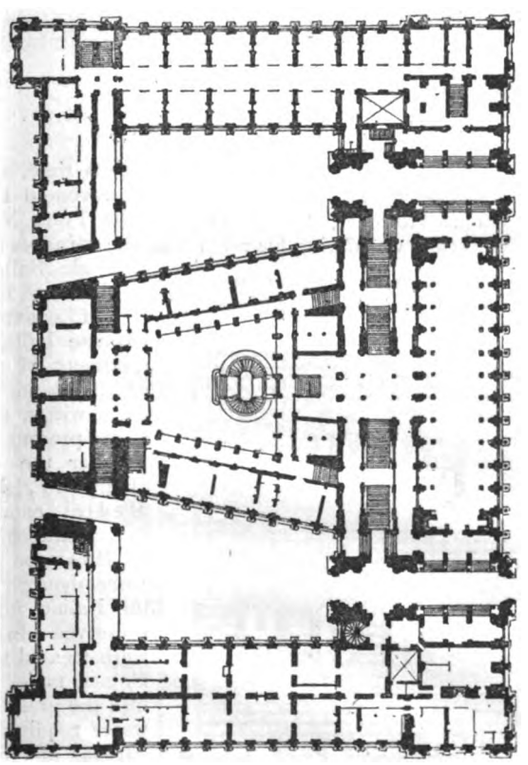

Fig. 19. Plan of First Floor, Hôtel de Ville, Paris.

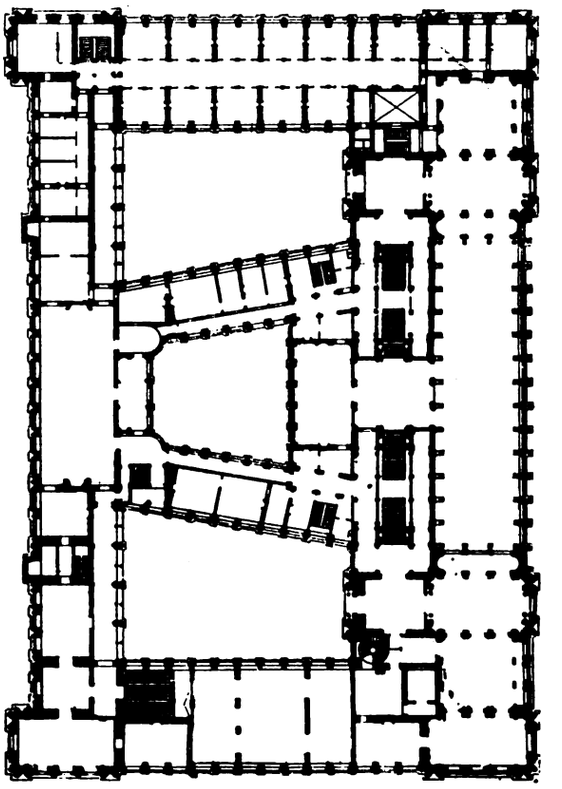

Fig. 20. Plan of Second Floor, Hôtel de Ville, Paris.

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attempt was made to acclimate the Italian style in France; then followed the Château de Gaillon, the Château de Blois, the *châteaux* at Meillant (Cher) and Azay le Rideau (Indre et Loire) and the Hôtel de Bourgtheroulde, at Rouen. Not every reminiscence of the original style was abandoned in

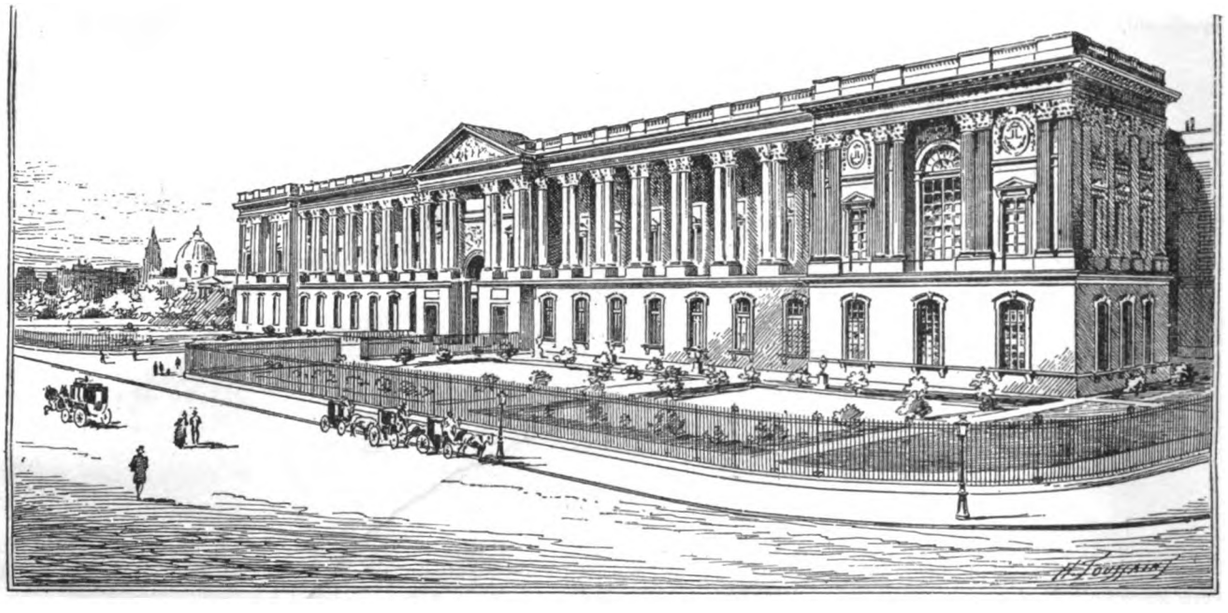

Fig. 21. Colonnade of the Louvre.

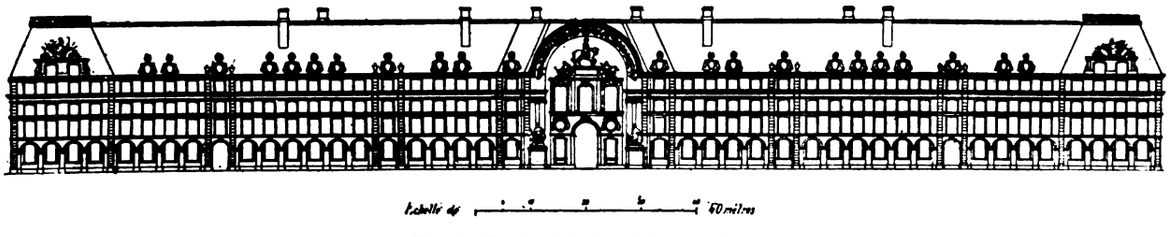

Fig. 22. Façade of the Hôtel des Invalides.

these edifices, no more than in the *châteaux* of St. Germain-en-Laye, Chambord and Chenonceaux, no more than in the tombs of the cardinals of Amboise and of Louis de Brezé in the cathedral of Rouen, no more than in the hôtels de ville of Noyon, Saint Quentin, Compiègne, Douai and Dreux, several of which still preserve the flamboyant style. It is in the Louvre and the Tuileries that the Renaissance exhibits its highest development, and in the Château de Fontainebleau, the *châteaux* of Anet and Ecouen and the lovely Fountain of the Innocents. It was also seen in the Château de Madrid which no longer exists, and in the old Hôtel de Ville, at Paris, begun in 1533 after the designs of Domenico Boccadoro, an Italian architect; and, finally, it was such artists as Philibert de l'Orme, Du Cerceau, Pierre Lescot, Jean Bullant, Salomon de Brosse and Jean Goujon whose works marked the bounds of the Renaissance in France.

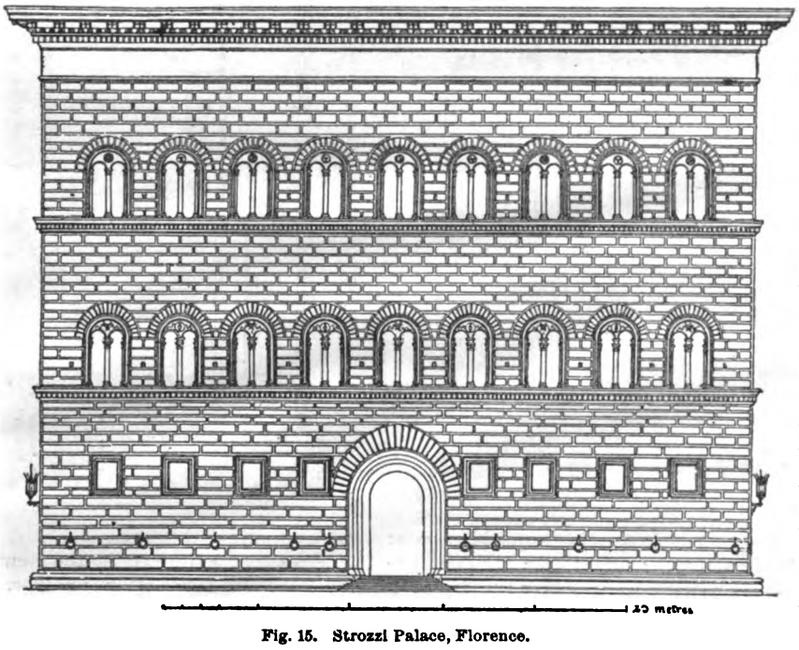

Fig. 15. Strozzi Palace, Florence.

Under Henry IV and his minister Sully, *grand voyer du royaume*, attention was for the first time centred on the sanitary requirements of the public: squares were opened in the cities, streets were widened and straightened. The Place Royale in Paris dates from this epoch (1605): in the surrounding buildings, made of brick and stone, there are galleries on the ground-floor for circulation, with shops in the rear. The Place Dauphine (1608) belongs to the same time, and others were projected, but Ravaillac's dagger prevented their construction. However, Henry IV saw the Pont Neuf completed, and it was during his reign that the corner-stone of the Hôpital Saint Louis was laid. A large number of convents were likewise built, but the treatment of structures of this kind does not come within the range of the present article.

After the death of Henry IV, Marie de' Medici commissioned the architect Salomon de Brosse to erect the Luxembourg Palace; the Italian forms were preserved in it, but were treated to suit the French taste. To furnish the great supply of water required for the gardens and palace, de Brosse restored the aqueduct of Arcueil. This restoration led to the construction of a great many public fountains on the left bank of the Seine. The same architect rebuilt the great hall of the Palais de Justice at Paris.

In the reign of Louis XIII the progress in civic architecture continued; edifices were modelled more and more after antique

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designs which the works of Vignola, Palladio and Serlio, with their accompanying illustrations and rules, had just made known. Richelieu commissioned Lemercier to erect for him the magnificent Palais Cardinal between the Louvre and the Tuileries, and in it he had two play-halls constructed, the first,

The same minister also built the Sorbonne and the work on the Louvre, the Tuileries and the Château de Fontainebleau was carried forward. New fountains were erected; new bridges were built [Pont Saint Michel, Pont Marie, Pont au Change], as well as castles, and private dwellings which became veritable

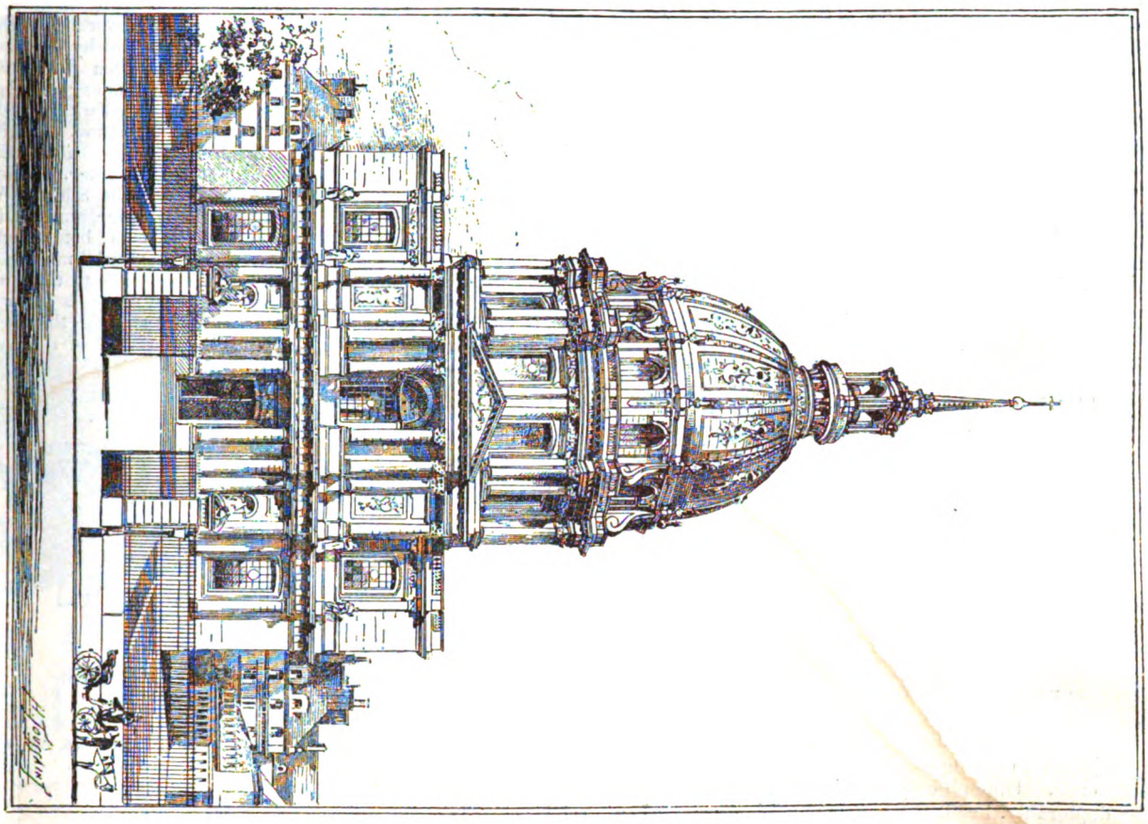

Fig. 23. Chapel of the Hôtel des Invalides.

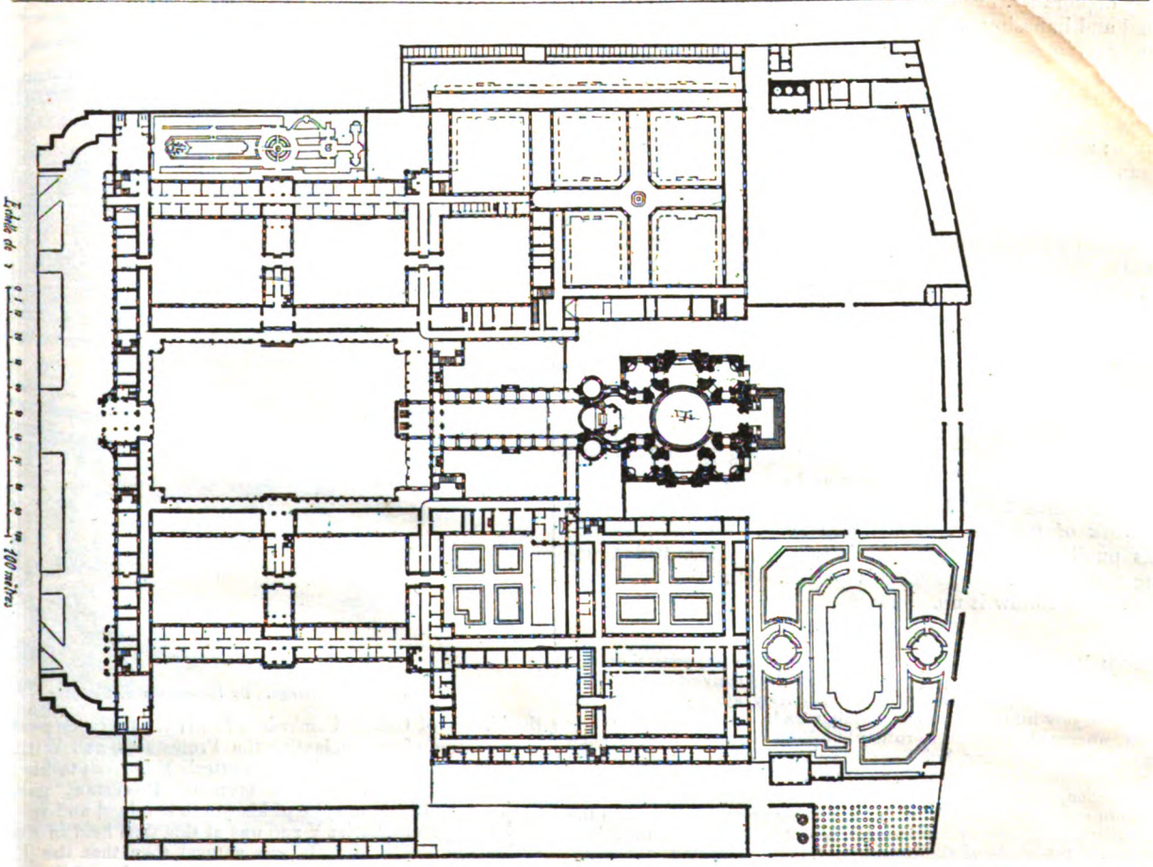

Fig. 24. Plan of the Hôtel des Invalides.

perhaps, to be designed in accordance with the modern spirit. The seats of the ancient theatre were replaced here by balconies or rows of boxes; and the stage was deepened in order to give room for the theatrical machinery and for purposes of perspective.

mansions. The Hôtel de Rambouillet, which belongs to this period, served as a model for later constructions of the same kind, and in the Hôtel Lambert a wealth of painted decorations was introduced hitherto undreamed of. Winding-staircases were replaced by staircases in the Italian fashion, the windows

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no longer had stone mullions, and the disposition of the interior bore witness to an entirely new spirit, in harmony with the refinements and distinction of the society of the times.

In several cities town-halls were erected, with a campanile in the centre of the façade which recalled the belfry of the Middle Ages. But the whole was clothed in antique dress. As examples of these may be mentioned the one at Rheims, with its two stories, one Doric and the other Corinthian, and the one at Lyons, which was begun three years after the death of Louis XIII, and which already foreshadowed the pomp and splendor that were to find their highest development under Louis XIV.

England and Germany followed France in the Renaissance. The Gothic style persisted in Germany until the middle of the sixteenth century; and it required great effort on the part of the princes, who were the first to adopt the new style and to procure its universal acceptance. As examples of this style may be cited the portico of the Belvedere at Prague, and the palaces of Otho, Henry, and Frederick IV at Heidelberg; then the castles of Toyau and Dessau, the court of the palace at Dresden, and the *châteaux* of Gadebusch and Gustow.

Among the town-halls, a great number of which were erected at this period, those of Cologne, Augsburg, Nuremberg, Bremen, Breslau, Altenberg and Dantzic are especially noteworthy.

In the seventeenth century, Italian influence was united in Germany with French and Dutch influence. Frederick William built a superb royal palace, and, following the example of Louis XIV, the German princes erected magnificent residences: they imitated the Palace of Versailles with more or less success at Stuttgart, Rastadt and Mannheim.

Later the Germans fell for a brief space into an uncouth style which was inspired by the style of Louis XV; but they were soon recalled to the study of Classic art by the excavations begun at Herculaneum, and by Winckelmann's work on the history of ancient art.

In France with the unity of monarchical power under Louis XIV, we see institutions become general which until then had been confined to here and there a city. The arts, like the State, were subjected to a single will which directed them to truly national ends. Undoubtedly originality and fancy suffered thereby deplorably, but it must in justice be acknowledged that a grand and imposing civil architecture grew out of this powerful unity of organization. In this seventeenth century were erected, first under the ministry of Mazarin, the famous palace of Mazarin, in which a part of the National Library is at present kept; the College des Quatre Nations now the palace of the Institute; and at Blois the great wing of the château, constructed by François Mansart for Gaston d'Orléans. Then under the administration of Colbert, Louis Levau restored the Tuileries and went on with the Louvre. The Colonnade of the Louvre (Figure 21) was the work of Charles Perrault. It harmonized perfectly with the prevailing ideas of pomp and splendor and it had a considerable success: in the *theatrical* style of architecture, which was destined to gain a hold in France, the nature of materials, as well as fitness and the purposes of the structure were too often disregarded, for the sake of show and pomp.

The highest expression of this colossal architecture, with its imposing and symmetrical distribution of parts, is found in the Palace of Versailles.

After the Palace of Versailles the Hôtel des Invalides is the most important work of the century, and certainly it is the most marked (Figures 22, 23, 24). The Porte Saint Denis, the chief work of François Blondel, and the Porte Saint Martin by his pupil René Bullet, especially the former, still figure among the noblest works of this period. But the list is too long for us to follow it up.

[To be continued.]

Swedish Penalties for Bad Building. — It so happens that two or three days ago I was holding a most interesting conversation with a gentleman who has resided in Sweden for twenty years, and during that time been largely interested in the building trade. I asked him why it was that, whereas here we have rotten buildings all around us, in such places even as Gottenburg, buildings other than those erected with the most perfect constructive soundness are not to be found? He replied that in Sweden, if a building owner contravenes the by-laws, he is liable to have not only the building destroyed, but his ground forfeited to the municipality; and, further than this, that for minor faults he brings upon himself the whole of the expenses of the supervising city architect and his staff, which, where all goes well, are borne by the public. I suppose, therefore, the gist of the matter is, that England being a "free" country, this freedom at times amounts to the permitting of licentiousness in some things. Yet it remains to be proved whether some of the more stringent building regulations which, in several Continental countries, stamp out the foul jerry-building fungus would not in this country be equally productive of good results. — *Building News.*

EQUESTRIAN MONUMENTS. — XXIII.

THE THIRTY YEARS' WAR.

Chair at Khorsabad.

In speaking of the statue of Alessandro Farnese at Piacenza a brief reference was made to the wars in the Netherlands in which, towards their close, he acted a leading part as the Spanish Governor of the country and in the field the worthy successor of the Duke of Alva and Don John of Austria. Against these three famous generals in succession one man contended with varying but at length triumphant fortune. This man is known in history by a *soubriquet* which singularly belies his real character. Though called "the Taciturn" or "the Silent," William of Nassau, Prince of Orange, was not the morose and misanthropic man betokened by this nickname — a title which makes his great popularity with his adherents incomprehensible to those who do not know his real character. In reality William is known as "the Silent" because, when a youth and a hostage with the Duke of Alva at the court of France for the proper observance of the conditions of

William of Orange. De Nieuwerkerke, Sculptor.

the Treaty of Cateau Cambrésis, Henri II of France confided to him his intention of exterminating the Protestants, and William kept his counsel although the project was utterly abhorrent to his nature. At this time William, although born of Protestant parents, was a Catholic, had been in spite of his youth a valued and trusted adviser of the Emperor Charles V and was at this time held in similar esteem by his son Philip II. It was natural then that the French King should have no misgivings as to the wisdom of confiding his intention to a fellow religionary, so the keeping of the secret became a thing remarkable enough to found a nickname on only in the light of after events. William's change from the Catholic to the Protestant faith was very gradual, the first stages taking the form of a political

[1] Continued from page 194, No. 722.

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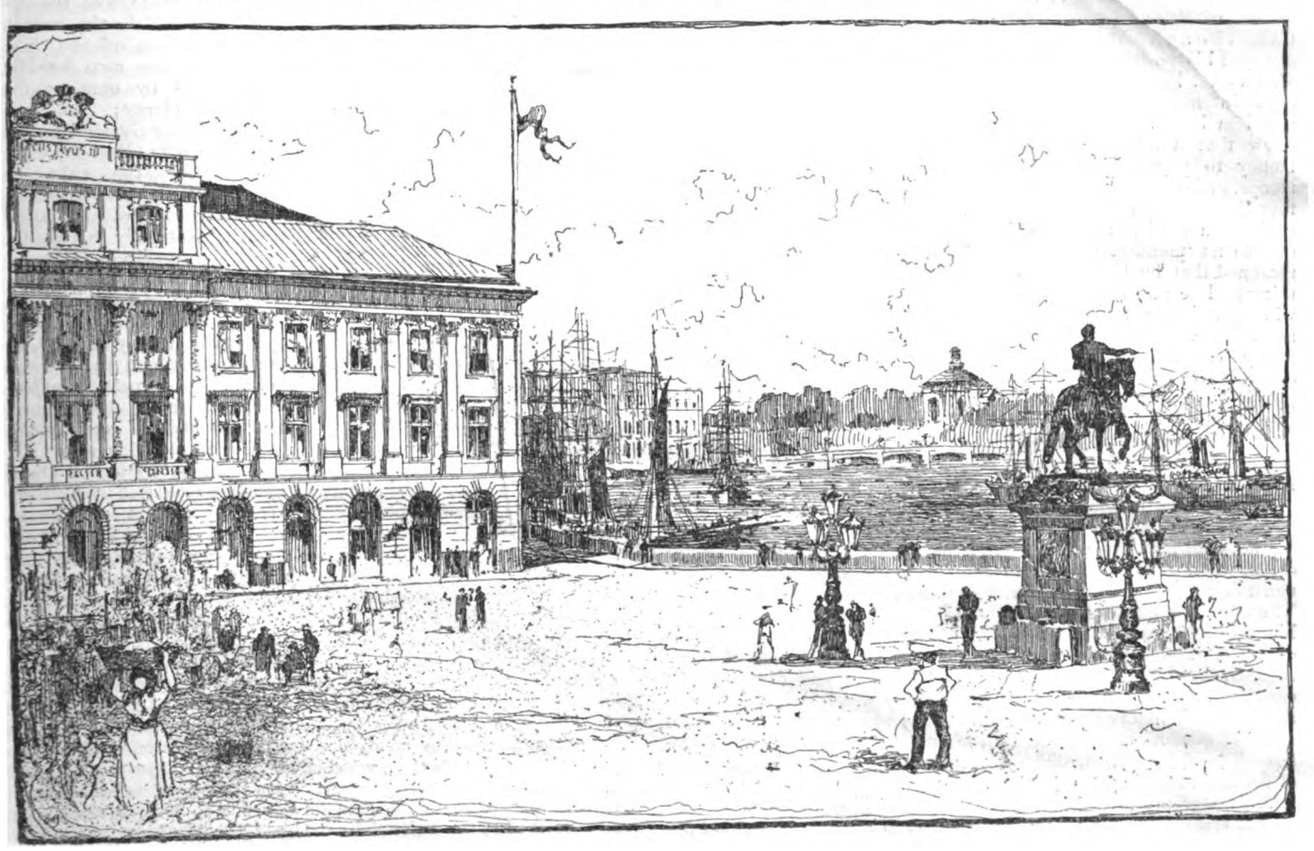
change of heart which led him to oppose the oppressive measures which the Spaniards adopted towards the natives of the country: particularly did he object to the introduction of the Inquisition with its attendant gloomy horrors. As a statesman and politician William of Orange has had few equals, and his success in holding his ground in the early struggles was largely due to the skill with which he made it appear that he was acting as a faithful servant of Philip in resisting what he was able to make appear the unjustifiable assumption of power by Cardinal Granvelle, the regent's prime minister. In these early attempts William was associated with Counts Horn and Egmont, having married Egmont's daughter two years before — the first of his four wives. From this time, 1563, to 1579, when the Union of Utrecht was formed, which dated the beginning of the Dutch Republic, William was constantly in the field resisting the oppressions of the Spaniards and, from the day of his entering the Calvinist Church in 1573, doing all in his power to uphold and advance the Protestant faith, though he took the liberal attitude of seeking only to secure absolute freedom of worship. The Massacre of St. Bartholomew cut him off from the expected alliance with the French Huguenots, although he later succeeded in forming a more personal alliance by taking as his fourth wife a daughter of the unfortunate Admiral Coligny. Whenever his efforts were unsuccessful he retired to his possessions in Germany and waited for time and opportunity to furnish the means of recruiting his forces and making a new attempt. It was while the Spaniards were advancing to attack Leyden that the dikes were cut by the determined Dutchmen which enabled Admiral Boisot to sail his ships over the flooded land to the relief of the city. It was not until 1581 that was abandoned the fiction that the rebellious provinces were still faithful subjects of King Philip, and that they were really only striving to get rid

November 16th, at Stockholm.

Gustavus Adolphus. Larcheveque, Sculptor.



Gustof Adolfs Torg, Stockholm, Sweden, with the Statue of Gustavus Adolphus.

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of obnoxious and overbearing garrisons of foreign soldiery. In July of this year the United Provinces declared their independence, and William was still more than ever the most popular man in the country. In the previous year Philip had offered a large reward and a patent of nobility to any one who would capture or slay his able opponent, and this led to the murder of William Prince of Orange in 1584 by Balthazar Gérard, a Burgundian fanatic, who slew him as he was leaving his dining-room. Gérard was seized and put to death with a refinement of cruelty with which the torturers of the Inquisition had made the people familiar.

To a man so famous and so popular as the Prince of Orange many statues have been erected, and if so amphibious a people as the Venetians looked with favor on equestrian monuments one might expect that other men who similarly affected aquatic pursuits would not wholly neglect the superior form of the equestrian memorial. The Hague, however, contains the only equestrian statue of William the Taciturn, the work either of the sculptor de Nieuwerkerke, or of the sculptor Royer, who carried de Nieuwerkerke's design into execution. The statue was erected at the order of William II of Holland, in 1845, and now stands in front of the palace. Upon the pedestal are sculptured the armorial bearings of the seven provinces of the kingdom.

Of the cruel Duke of Alva, the more illustrious predecessor in power of Alessandro Farnese, there was at Antwerp a colossal statue, which some authorities describe as equestrian, though later and more reliable writers speak of it as pedestrian. This statue which the Duke himself caused to be erected in the famous citadel which his engineer Pacheco built, not to defend but to overawe the city, was destroyed by the citizens in 1576, three years after the Duke, discouraged by the vain outcome of his attempt to crush the Protestant movement, obtained his recall. It was erected in honor of the campaign against the Prince of Orange in 1568, in which the Duke so successfully imitated the tactics of Fabius Cunctator that, though William changed his position twenty-nine times, he did not succeed in inducing Alva to give him battle. The Duke knew that William had no money to pay his hireling troops, and could not keep them in the field unless they could win battles and consequent plunder, and he reasoned that he had everything to lose and nothing to win by a battle that could not as well be gained by a policy of avoidance and delay. To carry out such a policy with an opponent of the address and military skill of the Prince of Orange was a task that even the consummate Spanish soldier found by no means easy.

Maximilian I. Thorwaldsen, Sculptor.

If the statue consumed three or four years in the making, as so large a statue probably did, it could have had but a brief existence, for no sane man could expect that men with blood in their veins could, when they were free to act, suffer the existence of an immortalizing memorial of so atrocious and blood-stained a tyrant. The atrocities committed by Alva are simply incredible, and if he himself could boast, on his return to Spain, that he had caused the execution of 18,600 persons, it is hardly likely, in the face of other records, that he did less. Every form of torture and every complicated and heart-rending method of inflicting death that a vindictive and merciless nature could devise was used without ruth. His treatment of women can be guessed at, when it is known that the disembowelling of pregnant mothers was among his more merciful methods of dealing with them.

A greater moral contrast than that offered by the humane and liberal William with the inhuman and narrow-minded Alva could not be conceived. Even if humanity and liberalism were not natural to the Prince of Orange, it was clearly the part of wisdom to simulate them as, by so doing, he could be sure of the support of those who had suffered under the Spaniard's heavy hand.

In these wars the Protestants of other countries interested themselves actively, and the final success of the Dutch patriots was in no small measure due to the aid of Elizabeth of England, who held her late sister's husband in especial detestation. The French Huguenots would have given greater aid than they did but for their own struggle for existence at that same moment; while the German followers of Luther and Calvin did furnish both men and money.

This war and similar contests elsewhere had done a good deal in the way of shaking the belief of the lower classes that they were made of such vastly inferior clay to that which composed the frames of the lords and gentles. The fact that they could at need defend themselves led them more and more to believe that they might think for themselves, and the more they thought the more they disbelieved in the superstitions fostered by the Roman Church, and the more they believed in the doctrines expounded by the Reformers.

This gradual disbelief in the tenets of Catholicism did not gain ground only in the lower classes and with those closet-students who naturally did most of the thinking and expounding, that is, the real leaders of the Reform movement. For many hundred years the possessions and wealth of the Roman Catholic priesthood had increased, sometimes gradually and sometimes by great steps and bounds, according as there happened to be in St. Peter's chair at Rome a more or less astute practical political economist — and there were very few Popes who were not able to so influence affairs as to throw into the hands of the minor dignitaries of the Church more or less wealth in the way of money and landed possessions; so at this time Europe was thickly sprinkled with wealthy abbeys and monasteries, where monks and priests lived in a good deal of physical luxury, while the higher dignitaries of the Church, bishops, archbishops and cardinals, were men of vast wealth and very considerable temporal power. Indeed, at this time, the archbishops of Cologne, Mentz and Treves were three of the seven electors upon whose votes depended the succession to the throne of the Emperor of Germany. For many years nobles of more or less power had looked with longing eyes upon the fat and flourishing possessions of these many dependencies of the Church, and they were only too willing to take advantage of the opportunity which the march of the Reform offered them to add to their own worldly possessions by ousting the Catholic clergy; consequently many German nobles embraced Protestantism merely for the sake of pillaging the possessions of the Church within their reach. Naturally this change in the ownership of the much desired wealth was not accomplished without violence in all cases, and for many years the history of all Germany had been the history of a series of petty conflicts. One of these disturbances which had a considerable effect in bringing about the Thirty Years' War was caused by the sudden immigration of Dutch refugees who could no longer endure the cruelties practised by Alva and his followers. These people came to Aix-la-Chapelle in considerable numbers, and shortly established a place of Protestant worship and behaved in such orderly manner that others of the inhabitants were gradually converted to the new religion, and Aix-la-Chapelle finally became a Protestant stronghold. What, however, brought about the final conflict between Protestantism on the one hand and Catholicism on the other, was the accession of Ferdinand II to the throne of the empire. The emperor of Austria was also the king of Bohemia; but Bohemia, where the name of John Huss is still more reverenced than that of Martin Luther, was the very hotbed of Protestantism, while Ferdinand, who had been brought up under the care of the bigoted Spaniards, was an ardent Catholic. In almost all of the German States there were certain rights and privileges vested in the people by former rulers, whose workings it is hard to understand. Just what they were in the case of Bohemia it is here needless to particularize, but the Bohemians declared that they would not have Ferdinand for their king. This practical deposition took place at just the same time that Ferdinand was soliciting the suffrages of the seven electors with a view to securing the succession to the Imperial throne; so that the curious spectacle is presented of a king who is dethroned and almost at the same time is elected to the Imperial throne, and so reacquires a somewhat larger authority over the people who had rejected him. In place of Ferdinand, the Bohemians elected the Palatine Frederick V, and naturally war at once

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followed between Ferdinand and Frederick, which gradually embroiled the whole of the central part of Europe, in a struggle in which the Catholic provinces and kingdoms openly sided with the Emperor, while the Protestants less openly aided the Palatine. The control of the Imperial armies gradually fell into the hands of Tilly, who proved himself one of the most capable generals of the day, and who would have left, in spite of his general severity, a fair name to posterity, if it had not been for the atrocities which were committed at the taking of Magdeburg. The Catholic cause gained such headway that all the Protestants of central Europe took alarm, and they finally united under the leadership of Christian IV, King of Denmark, who, at the same time with Gustavus Adolphus of Sweden, had offered his services. The more powerful armament of the Protestants now brought into the field on the Imperial side an even greater general than Tilly, Count Wallenstein, a Bohemian noble of great wealth and greater ability, a soldier trained in the wars in Hungary, a profound diplomat, but ambitious before everything. Against Tilly and Wallenstein the Protestants could make no head, and finally they were driven to the extreme north, and a portion of the Imperial army quartered itself upon the shores of the Baltic. This brought the seriousness of the situation home to Gustavus Adolphus with telling force.

Just before this time he had successfully repulsed the Russians and added to his kingdom a large territory, and as a consequence he possessed an army of hardy and well-trained veterans. All Protestant Germany appealed to him to cross the Baltic and assist their common cause. After for a short time weighing the chances, he crossed over into Pomerania, and, after several minor engagements, he had the address to make an ally of the Elector John George of Saxony, who had until then taken sides neither with one party nor the other. The united forces of Saxons and Swedes, reinforced by other contingents, defeated Tilly at the battle of Leipsic; and from that time on the career of Gustavus Adolphus was one of continued prosperity. This was in no small measure due to the sagacity of Richelieu, who, although a Catholic, and as such opposed to the Reformation, was as a statesman still more opposed to the agrandizement of the power of the House of Austria, which was so strongly allied with the interests of the Spaniards. Richelieu had the address to overcome the natural suspicions of Gustavus Adolphus and perfected an alliance between Louis XIII of France and Gustavus Adolphus, the Swedes furnishing 30,000 men, the French $400,000 yearly.

During his entire career Gustavus Adolphus showed himself most humane and considerate to friend and foe alike. Wherever his army went there order followed, and the contrast between the behavior of the Protestant army and that of the Catholics constantly led to the increase of the former. At length Ferdinand was so ill-judged as to dismiss Wallenstein in disgrace, and for some time the proud Bohemian noble lived in seclusion but surrounded by regal magnificence at Prague, perfecting his plans and waiting only for a chance to accomplish his revenge. Finding that all his other generals were unable to make head against Gustavus, Ferdinand at length found himself forced to recall Wallenstein, who, though at heart willing, pretended the utmost unwillingness to again enter the Imperial service. Finally he consented, raised a large army and took the field, but only under the extraordinary conditions that absolute power should be in his hands; that the Emperor and the Emperor's counsellors were to have no voice in his doings; that he was to be allowed to use as he chose all territory and possessions that might be conquered; that he was also to receive at once a large estate in Austria, and on the successful completion of his undertaking was to receive the Grand Duchy of Mecklenberg, with a still higher rank. Under these conditions he at length took the field with 60,000 men and approached Gustavus, who was then in the vicinity of Nuremberg, a free city attached to the Protestant cause. Gustavus immediately entrenched himself about the city, as his force was much smaller than the Imperial forces, and awaited reënforcements. Wallenstein entrenched himself outside of these fortifications, and blockaded the city and the army. At length reënforcements made their way to Gustavus until the armies were about equal; but as it was almost impossible to subsist such mighty forces, the sufferings and sickness on both sides were extreme, and finally Gustavus, who had several times offered battle, determined to assault the Imperial camp. The conflict which followed showed that it was impossible to dislodge the Imperialists, and at length Gustavus drew off his forces in one direction while the Imperialists departed in the other, only to meet again a short time afterwards on the fields of Lützen, where a pitched battle was fought, during which Gustavus lost his life, as some say, assassinated by a treacherous friend, Francis Albert, Duke of Saxe Lauenburg.

Portrait of Marshal Rantzau. From Gavard's "*Galleries Historiques de Versailles.*"

As Wallenstein seems never to have been honored with an equestrian monument, it is useless to follow to the end his schemes of ambition, which led to his final overthrow and assassination; but Gustavus was at once so noble a character and so able and successful a general that he afforded an attractive subject for the sculptor's chisel. Unfortunately the equestrian monument which has been erected in his honor is not a very successful work of art. This statue, the work of the French sculptor Larchevêque, stands near the Hotel Rydberg at Stockholm, and on the 16th day of each November the square surrounding it is filled with Swedes who congregate there to pay annual tribute of respect to their former ruler. One of the features of the exercises is the singing of the battle hymn which Augustus himself composed just before the battle of Lützen.

This statue was designed in 1777, but was erected only in 1796 so that it can hardly be the equestrian statue of Gustavus, which Patte describes in his book on the statues of Louis XV, since this book was published in 1765; moreover, the descriptions which Patte gives of this statue, also by Larchevêque, does not at all apply to the one now at Stockholm. As Patte says that he himself saw the statue, and as others speak of it as having been in the Place de l'Opera, it probably had an existence even if it never passed beyond the model stage. There is now no trace or discoverable record of its fate. It is possible it was only one of the sculptor's early studies, for the long time consumed in the production of the actual statue may indicate that he had to make several attempts before he could meet the wishes of those who placed the work in his hands, or, more probably still, before he could bring the cost within the limits of the appropriation. This vanished statue would seem to have been conceived in a very original vein for it represented Gustavus galloping at full speed and pursued by a mounted Victory who was vainly endeavoring to overtake him that she might place a laurel crown on his brow. The allegory pointed to the great rapidity of the King's movements which never allowed his enemies to escape him nor gave Victory, who by right should have perched on his banners, time to overtake him.

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Throughout the war, Ferdinand's firm ally and most valued adviser was Maximilian I of Bavaria, a strenuous Catholic, a statesman of great ability and a military leader who had few equals at the time. When the Protestant malcontents formed their Union the Catholics responded by creating a League, at the head of which Maximilian was placed. During the early struggles Bavaria was left in comparative peace, but it was finally invaded by Gustavus, who would have overrun the whole of it if he had not been called off in the middle of his victorious career to relieve his ally, the Elector of Saxony, and take part in the fatal battle of Lützen. Maximilian's faithful adherence to the interests of Ferdinand was rewarded with the transference to him of a portion of the Palatinate, which Frederick V lost together with his Bohemian crown, and with it went the electoral dignity.

In 1830, King Louis of Bavaria commissioned Thorwaldsen to model an equestrian statue of his ancestor. The sculptor consumed six years at Rome on the task, but the cast was so successfully made at Munich that very little hand work was needed to finish it; yet, in spite of this, it was not unveiled before 1839. The statue, which shows the Elector in the armor of the period, is eighteen feet high, or, including the marble pedestal, thirty-five and one-half feet. It now stands in the Wittelsbacherplatz at Munich.

Of all the soldiers and nobles who made name and fame during this tedious war, Gustavus, on the one hand, and Maximilian, the haughty Elector of Bavaria, on the other, are the only persons whom posterity has honored with equestrian monuments, though there were very many to whom such monuments might properly have been erected. One of these, a most picturesque personality, has come very near achieving such sculptured fame, at the hands, too, of a royal sculptor.

Josias, Count Rantzau, by birth a Dane, had served with distinction in the Swedish army, and at a later date had followed Gustavus's famous chancellor, Oxenstiern, into France, for, as has been

Marshal Rantzau. Dom Fernando, Sculptor.

said, the French had in the Thirty Years' War become the allies of the Swedes. Here Count Rantzau remained, and devoted himself to the service of France. Rising, thanks to his own impetuous personal bravery, to a position of considerable importance, he was finally made a marshal of France on promising to abjure the Lutheran faith. Owing to his rashness and unwillingness to keep himself out of danger, as a great leader should, he suffered bodily injury on several occasions. He lost an eye; he lost an arm; he lost an ear; and for years balanced, when in the saddle, a living foot on one side with a wooden peg on the other. So buffeted and mutilated had he been, that when at length he was laid in his grave, after having not only to endure physical suffering from wounds, but physical and mental torture through a long and unjustifiable imprisonment in the Bastile — where he died of the dropsy in 1650 — that the following epitaph upon his tomb in the Church of Minims, at Chaillot, seems to be a not too grandiloquent tribute to his merits:

> "*Du corps du grand Rantzau tu n'as qu'une des parts:*
> *L'autre moitié resta dans les plaines de Mars.*
> *Il dispersa partout ses membres et sa gloire.*
> *Tout abattu qu'il fût, il demeura vainqueur;*
> *Son sang fût en cent lieux le prix de la victoire*
> *Et Mars ne lui laissa rien d'entier que le cœur.*"

This interesting and heroic character attracted the admiring attention of Dom Fernando, the King Consort of Donna Maria II, Queen of Portugal, and, as Dom Fernando was an amateur of some ability, he amused himself with modelling an equestrian statuette of this, his favorite hero. The statuette was finally cast in bronze, and the one copy in existence now stands in the famous castle of Cintra, the country-seat to which Dom Fernando retired on the accession of his son to the throne.

Of Richelieu's ability as a writer of inscriptions for equestrian monuments we have in a previous paper quoted the evidence, and at the same time was mentioned the statue of Louis XIII, which now stands in the Place des Vosges at Paris.

The reason that the French were not able to give Gustavus more actual assistance during the Thirty Years' War was because Richelieu and his generals had their hands full at home in suppressing the

The Great Conde. Fremiet, Sculptor.

growing power of the Huguenots, who were favored at one time by Henry of Navarre, and subsequently oppressed with a heavy hand by the same great ruler. These malcontents made the reign of his immediate successor greatly disturbed by internal dissensions. Thanks, however, to his great Prime Minister, the feeble Louis XIII saw the royal power greatly extended. These internal dissensions, the wars with the Spaniards and the constantly-recurring troubles along the Rhine bred a class of great soldiers and greater leaders, who have left imposing records on the page of history, and none more glorious than that which describes the career of Louis of Bourbon, Prince de Condé, who, as Voltaire said, "was born a soldier." As he rose in power, through what he had accomplished in the field, he gradually excited the enmity of the carpet knights who staid at home; and they were at length able to give their jealousy such effect that during the wars of the Fronde he was cashiered by Cardinal Mazarin, and imprisoned for a year, in 1650. As soon as he was free, he went over to the Huguenot's side, and even besieged and took Paris, where, as we know, he caused the destruction of the equestrian bas-relief of Henry IV over the doorway of the Hôtel de Ville through the fire with which he burned down the door which opposed the entrance of his troops. In this siege and in other battles he was opposed to the almost equally famous Turenne. As one result of this rebellion he was sentenced to death, and in order to avoid the execution of the sentence he took refuge in Spain, where he remained until a general amnesty allowed him to return to France. After this he served in Holland, and only retired from active work in the field in 1675, after a career of thirty-seven years.

Such a character as this afforded the best material for such a sculptor as Fremiet, and he has modelled an equestrian figure, which shows the prince in the armor of the period, bare-headed except for the flowing wig of the time. It can hardly be said that this statue or statuette is one of the sculptor's most successful efforts.

Of Turenne, the famous opponent of the Prince de Condé, there is an equestrian statuette in gold and silver which was formerly in the Hôtel des Invalides, but now is placed in the Ecole Militaire, where it is impossible to get access to it because of the superabundance of official red tape; so what its actual character is cannot here be told.

William of Orange.— William of Nassau, Prince of Orange, called "William the Silent," the founder of the Dutch Republic, was born at Dillenburg, in Nassau, in April, 1533, and was the eldest son of William, Count of Nassau. He inherited princely estates in Brabant, Flanders and Holland and the small principality of Orange, in the southeast of France. He was educated by his parents as a Protestant, but, when about fifteen, was made a page of the Emperor Charles V, who soon saw his superior abilities, and placed much confidence in him, which he showed by making him a general-in-chief of the army, in the absence of the Duke of Savoy, in 1554. At Charles's abdication in 1555 he leaned on the shoulder of young William, who was considered the greatest Flemish subject of Spain, and was made one of the hostages given by Philip II to Henri II of France in 1559 for the execution of the treaty of Câteau Cambrésis. William's humanity and love of country decided him to oppose the cruel designs of Philip II and Henri II, but he acted with his characteristic caution and secrecy, and continued to serve as Stadtholder of Holland, Zealand and Utrecht and Councillor of State. In 1566, a great insurrection was provoked by

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the attempt of Philip II to establish the Inquisition in the Netherlands. In 1567 William refused to take a new oath of unlimited obedience, and offered to resign all his offices. The same year saw the arrival of the Duke of Alva, who came with an army and supreme civil power as governor to complete the subjection of the revolted provinces. A successful issue of the long struggle was at length reached, and the republic was founded by the union of the seven Protestant provinces of Holland, Zealand, Utrecht, Friesland, Groningen, Overyssel and Guelderland in 1579, when William was chosen Stadtholder. In July, 1584, he was assassinated by Balthazar Gérard, a Catholic fanatic. His life had many times before been attempted by Catholic assassins. To him belongs the honor of being the first among European statesmen to make a practical application in government of the principle of religious toleration.

DE NIEUWERKERKE. — Alfred Emilien, Count de Nieuwerkerke, was born at Paris in 1811, his family being of Dutch origin. A French administrator and senator, he practised sculpture only as an amateur, but meeting with much success exhibited some of his works in public. In 1849 he was made director-general of French museums by Louis Napoleon, then president of the Republic, who when emperor created for him (in 1853) the office of superintendent of the fine arts. In 1852 de Nieuwerkerke purchased for the Louvre, at the sale of Marshal Soult's pictures, Murillo's "Immaculate Conception" for $123,060, and during his administration added many other important and valuable works of art to the national collections. The annual appropriation for purchases of this nature was increased through his efforts and he rendered great services to the cause of art in many ways, especially by his energetic reforms in the Ecole des Beaux-Arts and the Prix de Rome. He retired from public life in 1870. His works in sculpture include the equestrian statues of William of Orange at The Hague, of Napoleon I and Napoleon III at Lyons and of Napoleon III at Napoléon-Vendée (now La-Roche-sur-Yon); an equestrian statue of Isabella the Catholic entering Granada; a statue of Descartes at Tours; one of Marshal Catinat for his tomb in St. Gratien; and a number of portrait busts. He has won a number of honors at the *Salon* and is a member of the Institute.

ROYER. — Louis Royer, a Dutch sculptor of Belgian extraction, born at Mechlin in 1793, died at Amsterdam about 1867. He studied at Paris under Debay, and in 1821 gained the Grand Prix de Rome at Brussels. After a stay of four years in Italy he settled at The Hague in 1825, and became sculptor to the king, and a member, and later director, of the Academy of Amsterdam. His principal works are: "Claudius Civilis"; "A Shepherd fleeing from a Serpent"; "Diana at the Bath"; "Hebe"; "Concord"; "Amity"; "Paul and Virginia"; "Ecce Homo"; "St. Cecilia"; "Rembrandt" and "Erasmus"; and he also produced a large number of portrait busts.

GUSTAVUS ADOLPHUS. — "The Lion of the North." "Sweden's Glory." "The Saviour of Protestantism." Gustavus Adolphus or Gustavus II, King of Sweden, born at Stockholm, December 9, 1594, was the son of Charles IX and grandson of Gustavus Vasa. He ascended the throne at the age of seventeen and soon gave evidence of his great abilities. Sweden having been invaded by Sigismund, King of Poland, and his ally the Czar of Russia, Gustavus defeated them, and in 1629 concluded a peace by which he gained a great part of Livonia and the town of Riga. Not long after he was invited to champion the Protestant cause in Germany. Before setting out, he published a declaration stating that he did so not for love of conquest but in defence of his religion and to avenge his injuries at the hands of the Austrian emperor. He landed in Pomerania with 8,000 men in June, 1630, his army being soon reinforced by six Scottish regiments under the Duke of Hamilton, and took the fortress of Wolgast. Advancing into Mecklenburg, he was met with overtures of peace from the emperor accompanied by the offer, among other things, of Pomerania, but these proposals were rejected. Gustavus lost his life at the Battle of Lützen, November 16, 1632. Schiller called him "incontestably the first commander of his century, and the bravest soldier in the army which he had created."

LARCHEVEQUE. — Pierre Hubert Larchevêque, a French sculptor, born at Paris in 1721, was a pupil of Bouchardon and won the first prize of sculpture in 1745. In 1755 he was made Associate of the Royal Academy at Paris, and afterward received the knighthood of the Order of St. Michael. About 1760 he was invited to Stockholm, and commissioned to execute the models for a statue of Gustavus Vasa and for an equestrian statue of Gustavus Adolphus. They were both cast in bronze, of colossal size, by a Swede, named Meyer. Larchevêque established a school for sculpture in Sweden and was honored with the Order of the Polar Star. He returned to France in 1776 and died there in 1778.

MAXIMILIAN I. — Elector of Bavaria; born in 1573. On the formation by the Protestants of the confederacy called the Union (1608), Maximilian put himself at the head of the opposing Catholic faction of the League. In conjunction with the Emperor Ferdinand II, he fought in the Thirty Years' War against the Palatine, Frederick V, and conquered the Upper and Lower Palatinate. In 1623 he obtained the electoral dignity of the Palatinate and the hereditary domains of Frederick V. Maximilian was an able ruler, and founded a number of colleges and other useful institutions. He died in 1651.

THORWALDSEN. — Bertel Thorwaldsen was born in Copenhagen in 1770. He was the son of a wood-carver, and while very young learned to assist his father. At the age of eleven he entered the Copenhagen school of art, soon displaying exceptional talents and won the highest prize, the travelling-studentship. In 1796 he started for Italy and arrived in Rome when Canova was at the height of his popularity. Thorwaldsen's first success was the model for a statue of Jason, which was highly praised by Canova, and he received from Thomas Hope, a wealthy English art-patron, a commission to execute it in marble. From that time the sculptor's future was assured, and he did not leave Italy for twenty-thre years. On his return to Denmark in 1819 he was received with the greatest enthusiasm, and was commissioned to make the colossal series of statues of Christ and the twelve apostles, now in the Fruekirke at Copenhagen. These were executed after his return to Rome, and were not completed until 1838, when he again returned to Denmark. Thorwaldsen died in 1844 and bequeathed a large part of his fortune for the building and endowment of a museum in Copenhagen, and also left to fill it all his collection of works of art and the models for all his sculpture. He is buried in the court-yard of this museum. Among his principal works may be mentioned the "Lion of Lucerne"; the monument to Pius VII in St. Peter's; the frieze representing the entry of Alexander into Babylon; the "Gutenberg Monument" at Mayence; the "Schiller Monument" at Stuttgart; and an equestrian statue of Poniatowski, formerly at Warsaw. He produced a great number of ideal statues and bas-reliefs, being especially gifted in designing works of the latter nature, and numerous portrait busts. Many of his productions represent Classical characters and incidents, and in their portrayal he was eminently successful. Probably his most widely known reliefs are those of "Night" and "Morning."

RANTZAU. — Josias, Comte de Rantzau, was born of an illustrious family in Holstein, which was then part of Denmark, in 1609. In his youth he served with distinction in Sweden, and then accompanied the Chancellor Oxenstiern to France and became attached to the service of Louis XIII, who made him colonel of two regiments. He covered himself with glory at the siege of Dole, in the campaigns in Flanders and Germany, and at the siege of Arras. He contributed to the victory of Rocroi, replacing Marshal Guébriant, who had been wounded. He was made lieutenant-general in 1643, and signalized himself in Flanders and Picardy, taking Cassel and Gravelines. In 1645 he received the baton of a marshal of France, and in the years between 1647 and 1649 gained possession of all the maritime cities of Flanders. But, suspected by Mazarin of holding communication with some of the malcontents, he was imprisoned in the Bastile, where he lay for eleven months. His innocence was finally established, but, in the words of a French writer, "this mutilated ruin of all our wars, after having faced a hundred combats," died of a dropsy, which he had contracted in his prison, in 1650. With all the qualities of a great general, Rantzau lacked discipline over himself, and was an incorrigible drunkard.

DOM FERNANDO. — Ferdinand Augustus Francis Antonio, Duke of Saxe-Coburg-Gotha, was born in 1816. He was the son of Prince Ferdinand of Saxe-Coburg, and first cousin of the Prince Consort of England. In 1836 he married Doña Maria II, Queen of Portugal, and, on the birth of his eldest son, received the title of King Consort. On the death of the Queen, in 1853, he assumed the regency and conducted the affairs of the kingdom until September 16, 1855, when he resigned the royal authority into the hands of his son, Dom Pedro V. Dom Fernando was an amateur artist of no mean talent, practising in the arts of painting, sculpture and etching, a man of literary tastes and an ardent book-collector. He shared with his cousin, the Prince Consort, a love for building, planting and improving the estates he purchased, and was an enthusiastic collector of furniture and bric-à-brac. He spent 8,000,000 francs on the erection of his country-house at Cintra. Dom Fernando died at Lisbon in 1885.

CONDE. — Louis II de Bourbon, Prince de Condé, styled "the great Condé," was born in Paris in 1621, and was the son of Henri II and Charlotte de Montmorenci. Under the title of Duc d'Enghien, he made his first campaign at the age of seventeen. In 1641 he married a niece of Cardinal Richelieu. He gained a great victory over the Spaniards at Rocroi in 1643, and another one in 1645 over the Germans at Nordlingen, also defeating the Spaniards in 1648 at Lens. In the civil wars of the Fronde he at first commanded the royalists, but, being arrested by the Queen, or Mazarin, in 1650 and imprisoned for a year, he, in revenge, raised an army and attacked the royalists under Turenne at Paris in 1652. In 1663, having been sentenced to death, he entered the Spanish service and directed several Flemish campaigns, being, however, less successful in these than usual. The treaty between France and Spain in 1659 procured him an amnesty, and he returned to his native land. He received the command of an army against Holland in 1672, and in 1674 defeated William of Orange at Seneffe. He retired from the service in 1675 on account of the gout, and died in 1686.

(To be continued.)

AMERICAN BRICKS.[1]

IN our Boston market three kinds of brick are best known: the Eastern or State of Maine, the New Hampshire and the Cambridge. The Eastern bricks are small in size, 7¼ x 2⅛ x 3¼ burned very hard, to a bluish red color, much admired, and rarely found elsewhere. For this peculiar and fine color these bricks have been shipped as far as the New York and, I think, the Philadelphia market. There is an abundance of very fine clay in the State of Maine. The New Hampshire bricks are a little larger in size, a fine brick, shipped largely to Boston, New Bedford, Fall River, and Providence. But Boston, with its consumption of from 150,000,000 to 200,000,000 bricks per year, depends mainly for its supply upon the Cambridge brick, so-called, including practically those of Chelsea, Revere, Everett, and Medford. These bricks are the standard, with us, for excellence, and none better are made anywhere.

I remarked a few moments ago, that the brickmakers of New England were keeping well abreast of ancient times, I will now complete the sentence. They are keeping well abreast of ancient times in the quality of their brick, and that is saying a good deal in their praise, I think. I really believe that there are no better bricks manufactured anywhere, or in all time, than are being made in New England to-day. Until recently no moulded bricks have been produced in our market, but we have looked to Philadelphia, New Jersey and Baltimore for our pressed brick and ornamentals. Within two years, however, two large plants have been erected at Boston for the manufacture of fine pressed brick by the semi-dry process, and are a great addition to the brickmaking industry of New England, viz.: the New England Anderson Pressed Brick Company and the Boston and Philadelphia Front Brick Company. These enterprising parties have, perhaps, somewhat anticipated the demand, but as a good article ready for the market often creates a demand, so, no doubt New England will duly appreciate the invitation thus extended.

One thing I wish to impress on your minds, gentlemen, about New England brick, viz.: It is not necessary to paint them in order to get a fine-colored, rich-looking front. To the mind of a New England brickmaker, the idea of painting a brick wall is a horrible one. No wonder that a great New England poet, familiar all his life with the beauty of New England bricks, should sing in plaintive strain:

> "Of all sad words, from our lips which fall,
> The saddest are these, 'A painted brick wall.'"

Now I want to say a word right here about our late great fire in Boston. Mr. Ittner spoke yesterday about seeing a statement to the effect, that the stone melted — well, some of the stone did melt, and some of the brick melted too, though not a great deal of either. The great fault with those stone fronts was, that the moment they became heated to a certain degree, they began to fly, especially if a stream of water was turned on them, they exploded as if they were being blasted with powder. This cannot be said of the brick walls, which stood this test much better. That fire was a great lesson in favor of brick and terra-cotta construction.

My own experience in clay working has been confined to the manufacture of architectural terra-cotta, fire-brick, and specialties in front bricks, and this brings me to one phase of the brickmaking industry which is very interesting, just at present, and that is the large and

[1] Extract from a paper by Mr. George M. Fiske read at the Fourth Annual Convention of the National Brick Manufacturers' Association.

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growing demand for light-colored bricks for fronts. This demand is fully upon us in Boston. New Jersey sends us these bricks to some extent, but our architects can also find what they want nearer home. To be sure, we labor under this disadvantage, that we depend upon New Jersey for our most available supply of light-burning clays. About the best we can do is to buy at seventy-five cents per ton on vessel at Jersey, pay $1.25 flat as freight, which puts the clay in the pile alongside the factory at about $2.25 per gross ton.

This, I say, is about the best we can do. Our higher grades of fire-clay cost us more. But, I hear some one ask, You don't use fire-clay in making front brick do you? Certainly. In fact, all clays which will produce a light-colored brick, are in a degree fire-clays. I am aware that there is a difference of opinion as to what constitutes a fire-clay, but a line must be drawn somewhere, why not draw it at the color line?

But the Boston front brick, to which I have referred, are not always composed of a low grade of fire-clay. Some of the best bricks which we have produced have been made of a high grade of fire-clay, so manipulated in the manufacture and burned so hard under intense heat, that a brick is produced upon whose enduring qualities I would be willing to stake my reputation, every time. But it is not in Boston alone that fire-clay building bricks are produced. In New England, at Somerset, Mass., the Somerset Potter's Works, have just completed a fine plant with a capacity of three million or more per year, for the production of fireproof front bricks. They are fitted up with a fine layout of English methods and machinery, and their enterprise is an important one in the history of New England brickmaking. I have spoken of the demand for light-colored bricks, as being an interesting one, but the demand is not merely for a light-colored brick, but for specialties in color. Buff, old gold, mottled, and other odd and beautiful colors, which can be produced by fire-flashing under heavy fire.

Not only that, but the demand is for diversity of shade in bricks for the same front. Now, right here, a great change has come over "the tenor of the dream" of our architects. A few years ago, we had the greatest difficulty in inducing them to accept our architectural terra-cotta, unless it was burned to very nearly even shade. Now, the desire is for a diversity of shade; in some brick fronts recently erected in Boston, bricks of as varying shades as these two pieces which I hold in my hand are laid side by side. This is a great gain to the brickmaker in the matter of culling, and ought to suit us if it does the architects and owners. But there is still another interesting fact connected with this demand—and that is that the architects in their desire to obtain these specialties in color, are throwing mechanical perfection to the winds. You brickmakers well remember that, not many years ago, there came a strong demand for a mechanically perfect brick. Our friends here in the Quaker City, were among the first to cater to that demand, and their bricks became famous throughout the land. Others took it up, and ere long the semi-dry process, with wonderfully improved and perfect machines and presses was turning out bricks, whose mechanical perfections have never been excelled in all the world. You can go to scores of yards to-day, and select moulded bricks, so perfect in form and finish that they would make good parlor ornaments. But that spirit of change, which keeps the world moving and gives us that variety which is the spice of life, has suggested to our architects, that mechanical perfection alone, in bricks, will not produce the strongest and most beautiful effects in architecture. Color and outline are equally important,

It is well-known to all clay-workers, that heavy firing means, more or less, warped, twisted, and crooked work, and as the heavier the fire the more beautiful the color—our architects are saying, "only give us these colors, and we will use your rough and twisted brick." And so it has come about that some of the roughest and coarsest material is being used to produce some of the finest effects in architecture; some of the Pompeian mottled bricks are so rough that the man who lays them showers malediction on the head of the man who makes them; but when well-laid in the wall, they look as soft as velvet. An architect asked me not long ago, "Have you any accidents at your factory?" "What do you mean?" said I. "Why I mean any bricks which have been accidently burned too much." "Oh, yes," I replied, "plenty of them." He came over and I showed him a lot of refuse stuff, some of which had been broken out of the kiln with a crow-bar, and which I expected to send to the dump. He was delighted with it. "Beautiful!" he exclaimed—"elegant! I will take the lot and build a cottage at the beach for a rich client of mine." So I expect to get double price for my accidents after this.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

ENTRANCE HALL IN HOUSE OF PROF. C. E. HART, NEW BRUNSWICK, N. J. MR. HENRY RUTGERS MARSHALL, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print issued only with the Imperial and International Editions.]

HOUSE OF PROF. C. E. HART, NEW BRUNSWICK, N. J. MR. HENRY RUTGERS MARSHALL, ARCHITECT, NEW YORK, N. Y.

THE frame of this house was very old, but the good form of the exterior had been entirely destroyed by modern carpentry decoration some forty years ago. The doorway, as it appears on the elevation, was the centre of the house as found. It was desirable to increase the size of the house, and so there was added on the portion shown on the right of the picture, and, leaving the door where it was, the front porch was built out in such shape as to gain new symmetry for the house. Then a new roof, the cornice and all the decorative features as shown were added. The interior hallway was originally the parlor, but by putting the stairs in the rear of the room, the chimney, as it existed, was thrown out of the centre and a symmetrical arrangement was attained as is shown, by the triple columns, with seat on the right-hand and the fireplace on the left. The whole of the finish of this hall is new.

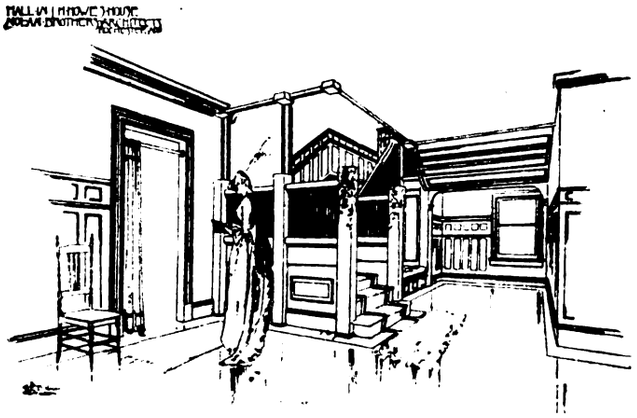
HOUSE OF WM. STORRS WELLS, ESQ., NEWPORT, R. I. MESSRS. G. K. HARDING & CO., ARCHITECTS, NEW YORK, N. Y.

HOUSE ON PORTSMOUTH TERRACE, ROCHESTER, N. Y. MR. W. C. WALKER, ARCHITECT, ROCHESTER, N. Y.

TOWER SKETCHED FROM THE COMPETITIVE DESIGN OF MR. C. B. ATWOOD, ARCHITECT, FOR THE NEW CITY-HALL, NEW YORK, N. Y.

A TOWN CLOCK-TOWER DESIGNED BY MR. WILLIS POLK, ARCHITECT, SAN FRANCISCO, CAL.

HOUSE OF J. H. HOWE, ESQ., ROCHESTER, N. Y. MESSRS. NOLAN BROS., ARCHITECTS, ROCHESTER, N. Y.



SITTING-ROOM IN HOUSE OF J. H. HOWE, ESQ., ROCHESTER, N. Y. MESSRS. NOLAN BROS., ARCHITECTS, ROCHESTER, N. Y.

[Additional Illustrations in the International Edition.]

STREET VIEW, SANTIAGO, CHILI.

[Gelatine Print.]

A STREET VIEW IN DINAN, FRANCE.

[Grano-chrome.]

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE. MR. J. L. FAXON, ARCHITECT, BOSTON, MASS.

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE. MR. S. C. EARLE, ARCHITECT, WORCESTER, MASS.

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE. MR. EDWARD P. CASEY, ARCHITECT, NEW YORK, N. Y.

THE DRAWING-ROOM, HOLCOMBE, CHATHAM, ENG. MR. JOHN BELCHER, ARCHITECT.

HALL, COOMBE-HOUSE, NEAR SHAFTESBURY, ENG. MR. E. TOWRY WHYTE, ARCHITECT.

THIS house, which has been recently erected for Mr. Mark Beaufoy, M. P., is situated on the borders of Wiltshire, and is built

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of local green sandstone, with red Farleigh dressings. The hall, of which we give an illustration, is two floors high, and has a dado panelling of oak and teak; the staircase and gallery are of oak, the chimneypiece of black Galway marble, with oak overmantel and walnut columns. The house is lighted with electric-light. The drawing which we reproduce was exhibited in the last Royal Academy Exhibition.

THE CHAPEL OF ST. MARY OF NAZARETH, EDGWARE, ENG. MR. JAMES BROOKS, F. R. I. B. A., ARCHITECT.

THIS illustration shows part of the fine church now in course of erection at Edgware. The design fully exhibits its author's feeling and thought, and is one of much power, happily expressed by Mr. Burke Downing's picturesque sketch.

SWIMMING-BATH AND GYMNASIUM AT THE GROCERS' COMPANY'S SCHOOLS, HACKNEY DOWNS, ENG. MR. H. C. BOYES, ARCHITECT.

THIS building, recently built, is arranged for use as a swimming-bath in summer and a gymnasium in winter, a removable floor being fitted over the bath, which is eighty feet long by a width of thirty feet.

SOCIETIES

THE CLERK-OF-WORKS. — CONTRACTS WITH CLIENTS.

AT the Cincinnati Convention of the American Institute of Architects a Committee was appointed to consider and report upon the subject of supervision and the employment of clerks-of-works.

The purpose of this Committee is to better define the responsibility of the architect in the matter of supervision, and also to inquire as to the best means of introducing the system of the employment of clerks-of-works.

The Committee is collecting information, and without doubt there are many of your readers who could offer them valuable suggestions. Will you therefore kindly invite an expression of opinion upon the subject in your columns, for the consideration of the Committee when it meets?

One of the questions which will arise is, Shall supervision be defined by means of a printed contract between the architect and client?

Another is, Shall this contract include stipulations that a clerk-of-works shall be employed in certain cases?

Any experiences or views upon the subject will be very welcome.

Yours respectfully,

R. W. GIBSON,
D. ADLER,
W. G. PRESTON,
J. G. CUTLER,
W. R. FORBUSH,
} Committee.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

A CORRECTION.

CLEVELAND, O., January 27, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs: — In this week's issue of the *American Architect*, the residence for Mrs. S. T. Everett, Cleveland, O., should be credited to C. F. and J. A. Schweinfurth, architects, Cleveland, O.

Mr. J. A. Schweinfurth was associated with me during the early part of its construction.

Very truly yours,
C. F. SCHWEINFURTH.

[Not knowing whose house our camera had captured, we had to write to a Cleveland architect for the necessary identification and published the information as obtained in this way.— EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

ELECTRICITY AND INSURANCE. — Notwithstanding that rules for safe running of wires and installation of electric-light plants are well-known, or, at least, can be gotten out with very little trouble, the fact remains that the manner in which this class of work is still done is open in many cases to criticism. The fact, says the *Electrical World*, has been called to our attention more than once by electricians from abroad, the most recent of whom, Mr. Addenbrooke, in a paper read before the London Institution of Electrical Engineers, speaks on this point at length; but these criticisms have often little effect upon those in charge of such installations, and it is only when their pockets become directly affected by the condition of affairs involved in such practices that they begin to realize that some change is desirable. This does not happen, as a rule, until the insurance inspector, on his rounds, sees the faulty construction both of the station and of the equipments, and fixes the rate of insurance accordingly. Then there is heard a great wail, and not unfrequently complaint of unfair treatment. It is safe to say, however, that the insurance companies would not place any obstacles in their own path to secure business, and their action is prompted as a measure of self-defence. They are, indeed, in many cases justified, especially when they get a report such as that which has been recently made by Mr. A. E. Braddell to the Secretary of the Insurance Association of the Middle Department at Philadelphia. Mr. Braddell, who is thoroughly equipped with a theoretical and practical knowledge of electric-lighting, inspected fifty-seven electric-light stations and isolated plants in Pennsylvania, and, as his report shows, the work as a whole is poor, particularly in the running of wires. The defects which he points out as existing in the installations are probably but a fair sample of what would be found in almost any other State upon as rigid an examination. It is natural to suppose that the insured parties will at first object to the enforcing of what might appear too stringent rules; but the experience gained in New England is, that once the change has been made, the insured parties themselves are pleased even more than the insurance companies, and, leading, as it does, to lower insurance rates, it finally turns out to be a direct gain to the insured. Mr. Braddell's experience also demonstrates that a better class of attendance should be insisted upon for electric-light stations than seems to be the case at present, and it is to be hoped that some measures may be adopted to secure for other localities the benefits which undoubtedly have accrued from the establishment of the license system undertaken by the New England Electric Exchange, whose work has served to lift the standard of efficiency far above that which existed in the New England stations, especially in the district of Boston. The Middle Department is to be congratulated on securing the services of so competent and conscientious an inspector as Mr. Braddell.

WATER USED IN THE BOSTON FIRES. — At a recent meeting of the New England Water-Works Association, held in Boston, President Dexter Brackett made some remarks on the recent Boston fire. The total number of engines in use on this occasion was 52, which, with the assistance of the hydrants of two large business concerns in the district, gave a total of about 86 streams of water, yielding approximately 20,000 gallons per minute. He estimated that, exclusive of leaks and waste, there was a total of 24,000,000 gallons of water thrown on this fire. Twenty-five hydrants supplied all the water drawn through 8-inch and 12-inch pipes, fed by the 24-inch main, and there was an ample supply of water, as was shown from the fact that water could be drawn during the fire at the tops of buildings in the water-circuit then in use. Referring to the great Boston fire of 1872, Mr. Brackett, stating that there were 21 engines belonging to the city, assisted by 45 from outside, making a total of 66 engines used at that time, said it was a question whether the quantity per minute then shown was any greater than at the conflagration of November last. A member of the Association said that there should be some understanding between the fire and water departments of a city as to the number of streams to be used in any given circuit, illustrating his remarks by referring to the case of a house between two hydrants being completely burned on account of using both hydrants at the same time, whereby the pressure was so reduced as to give two small streams, doing little or no good, in place of one large and effective discharge of water, which might have been obtained by using only one of the hydrants. At the Lynn fire, from the cause spoken of, the pressure was reduced from 60 to 23 pounds. — *Providence Journal.*

VANDALISM IN ROME. — Rome is threatened with one of the most barbarous demolitions which have been either proposed or carried out in this city, and this time it is not the municipality which proposes it, but the royal Government, through the Minister of Public Works. It is proposed to cut away the front of Sangallo's bastion on the Tiber side of the Castle of St. Angelo, the erstwhile Tomb of Hadrian, in order to widen the street, a mutilation which would entirely destroy the symmetry and picturesque aspect of one of the few mediæval structures left in Rome, as the ancient form of the tomb is beyond any restoration, and its present condition is the work of one of the most celebrated and masterly of the architects of the end of the fifteenth and beginning of the sixteenth centuries. The slicing off of the fronts of these bastions would destroy altogether its mediæval character without restoring the antique. The more modern outworks are of no importance and their removal would display to advantage the whole of Sangallo's plan and would give all the roadway needed. The Ministry of Public Instruction, with its usual zeal for the ancient monuments, has entered a protest against the mutilation, but as it is a case of one ministry against another, it is not sure that the building can be saved. — *London Times's Rome Correspondence.*

THE INCREASE IN THE NUMBER OF ELECTRIC LIGHTS AND MOTORS. — The increase in the use of electric-lights and electric-motors is shown by the *Electrical World* to be even greater during the past few years than most people probably imagine. The number of electric-lighting companies in the United States and Canada operating central stations at the beginning of 1886 was 450. This number had increased at the

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beginning of 1887 to 750, at the beginning of 1889 to nearly 1,200, and at the beginning of 1890 to 1,277, including twenty-five in Mexico and Central America. Meantime 266 gas companies have engaged in electric-lighting, so that the total number of companies engaged in electric-lighting at present is 1,543. The number of isolated or private incandescent and arc-light plants at the beginning of 1887 was about 1,000 each. Now there are 3,925 private plants in the United States, 175 in Canada, and 200 in Mexico and Central America, making 4,300 in all. The number of arc-lamps in use in 1882 was 6,000. This number doubled each year, for four years, and has since grown rapidly until there are now 235,000 arc-lamps in use. The number of incandescent lights has increased from 525,000 in November, 1886, to 3,000,000 at present. The number of electric-motors now in operation in the country is estimated at 15,000, many of them of from fifteen to fifty horse-power. There are nearly 200 electric-railways in over 125 towns and cities, and these have in operation or under contract 1,884 cars on 1,260 miles of track. These motors find their greatest application in connection with electric-light plants. Electricians, however, look for a great development of electric-motors for railroads of all kinds during the next two years. Electric-light and electric-power for mining is a new development of considerable promise. The electric-tramway and electric-power for pumping, drilling, cutting, etc., has already been adopted to some extent with good results.

Bad Blood Among the Artists. — It is impossible to avoid recurring to the subject of the quarrel among the French artists; otherwise I should be accused of not being *dans le train*. The difficulty is not yet arranged, and it looks as though the committee of the Artists' Society, with M. Bouguereau at its head, would be forced to give in its resignation. The dissenters, under M Meissonier's lead, are forming a new society, and decline to entertain any propositions from the committee of the old society. "Il est trop tard," is the only reply that M. Meissonier has deigned to make to the delegates appointed to wait upon him and to endeavor to harmonize the conflicting interests. Meanwhile the Artists' Society has decided to print in the next *Salon* catalogue the names of all the artists recompensed at the Universal Exhibition, and to suppress hereafter all exemptions. The prospect of two distinct societies is more agreeable to the painters than to the engravers, sculptors and architects, who are eager for reconciliation. They see very well that while exhibitions of paintings alone can be numerous without great detriment to the artists, it would not be the same for statuary and architecture. M. Guillaume, of the Institute, is of opinion that two distinct *Salons* would seriously injure the French school of sculpture, which is now so flourishing, and that if a double *Salon* is the final result of the present dispute, the *Salon* itself will soon disappear. — *London World.*

The Result of the Artist Van Beers's Suit. — Mr. Jan Van Beers, the Belgian artist accused by certain workmen, formerly in his studio, of signing paintings made by them and others and selling them as his own, has had his reputation cleared by a court of justice. His defeat in a lower court caused Sedelmeyer, the art-dealer who brought to this country Munkacsy's "Christ Before Pilate" and other pictures of notoriety or repute, to break a contract he had made with Van Beers to allow him the use of his gallery in Paris for an exhibition of the artist's works. Since Van Beers has won his case in an upper court, which reverses the decision in the lower and clears him of the charge of manufacturing spurious Van Beers's, the art-dealer has had reason to rue his haste. Van Beers has won a suit against Sedelmeyer, who will have to pay damages and costs. — *New York Times.*

Archæological Discovery in Rome. — An important archæological discovery has been made in the course of the works for the drainage of the quarter on the right bank of the Tiber. At the point where the new canal-collector traverses the Via Lungaretta, and at a depth of twenty feet below the surface, there have been brought to light the remains of a massive and well-preserved construction in square blocks of tufa. They consist of two large arches, one of which has been entirely uncovered, and the other partially so. They have an opening of nearly ten feet and a depth of nearly twenty, the pilaster upon which they rest having a front measurement of about eight feet, and a lateral one of nearly twenty. Over the frame of the arch rise five courses of blocks of stone, the uppermost of which projects on both sides, forming a cornice. The date of the construction, which has a certain resemblance to the Servian walls, goes back probably to the first centuries of the republic. The engineer, Signor Domenico Marchetti, who is employed by the Government, has measured and examined this construction. He traces in it the remains of a very ancient viaduct which connected the Janicolense, Cestio and Palatine bridges. The Via Lungaretta exactly follows the direction of this viaduct, and has preserved approximately the same width. The Romans, according to Signor Marchetti's explanation, saw the necessity of artificially raising the road on the shores of the Tiber at this point, where it dipped into a valley into which flowed the waters from the Janiculum Hill, and stagnated there. The open arcades left a free passage for the waters to find their way to the Tiber, and the viaduct formed a level and direct communication between the bridges. The actual road is ten feet above the ancient level. — *London Standard's Rome Correspondence.*

Remarkable Copper-Rolling. — Some interesting trials of skill have recently taken place among the workmen employed in the rolling-mills of Birmingham and Ansonia, Conn. One operative rolled an old-fashioned copper cent into a strip 18 inches long and 3-2000ths. inch thick. In a spirit of emulation, other workmen essayed cent-rolling, and the record was broken by an Ansonia roller, who, commencing with a modern alloy cent, finished with a strip of metal 38 inches long and 1-500th. inch in thickness. Afterward, with an 1888 cent, the same man obtained a ribbon of bronze 50 inches long, 3-4 inch wide and 1-2000th. inch thick. Trying again with a cent of this year's coinage, the Ansonia man succeeded in producing a strip 59 inches long and less than 2-1000ths. inch thick — so thin that there was no instrument delicate enough to measure it, while it had to be glued to a strip of ribbon to prevent its breaking. Considering that the rolls used were those employed for forming great bars of copper, it will be seen what extraordinary skill and delicacy of touch were required. — *Exchange.*

TRADE SURVEYS

One of the curious and interesting commercial phases of the hour is the extraordinary investment of capital in new enterprises on both sides of the Atlantic. In Great Britain the investments in corporations and companies of all sorts amounted to $450,000,000 in 1884, while last year the amount was $900,000,000. A craze exists for investment and many schemes are, of course, hurried to the front to catch the wind of popular favor which are undeserving of confidence. The only applicable comment perhaps is, that the mistakes that will unavoidably be made will act as a conserving factor and lead to the future investments of surplus cash in safer and more profitable directions. In this connection it should be remarked that British capital is seeking investment very largely in South America, in Australia and also in Canada. The same spirit of enterprise has been abroad in the United States for years past, but has showed itself in a different way; it has been the means of establishing yearly from 10,000 to 12,000 new industries, big and little, in the United States; and so far as commercial statistics show, the great majority of them have been successful, or at least are still alive. In Great Britain these investments are made under the direction of large companies; in our own country investments are made by individuals under their own supervision and at their own risk. In the one case commercial character and capacity in the individual is not developed; in the other case it is. In the States the investor, perhaps in a majority of cases, is responsible for the fate of his dollars; he looks after them with a keen eye, and develops foresight and capacity for management which would not be the result were his investment under the control of a corporation as is usually the case in England. The opportunities for investment in America are, of course, many fold greater and of a character which large corporations could not so well manage. Hundreds of foundries were started last year, hundreds of saw-mills, scores of shoe-shops, hundreds of machine-shops, in fact a thousand and one manufacturing enterprises have taken root through the efforts of individuals and firms in nearly all sections of the country. The American people are developing a commercial character which will not much longer be content with home victories. Schemes are coming to the front for the development of foreign trade, and the establishment of industries under the control of American capital and skill in several foreign countries. Of course a great deal of this enterprise is experimental and will be unproductive. Great Britain has the advantage of us, and it will will probably be many years before we learn the necessary lessons, the necessary capital provided and banking facilities established. Even had America the products to sell, it has not now the facilities for selling them in foreign markets. The establishment of contemplated ship-lines is only one step in that direction; prominent mechanical engineers have been engaged to furnish approximate estimates for ship-yard work, and it is understood that so far as the canvass has been made for capital, there will be no difficulty in obtaining all that is necessary.

Referring for a moment to the iron trade, it is found that productive capacity is galloping ahead. Furnace managers are endeavoring to accumulate stock, but with orders mortgaging the bulk of their production two to three months ahead. In many cases an accumulation is practically impossible. There is a great deal of inquiry this week for pipe-iron, plate, structural iron and steel blooms and billets. In Western and Southern markets, the multitude of inquiries is a strong intimation of a smouldering demand. The expansion of the agricultural West and South is creating a market that will be of the utmost value to industrial interests east of the Mississippi River. A great deal of iron is going into buildings, because of the low prices which have been established for it within a year or two. In financial quarters, excellent reports are given out. At latest count-up, the surplus reserve reached $15,000,000, as against $20,000,000 at this time last year, and this, too, in spite of the fact that the volume of business is fifteen per cent greater than then, according to all accounts. This fact is worthy of attention. It proves that an increasing volume of business can be done with less money, but the precise reasons why this fact exists would call for too much detail for this column. More solvent conditions, shorter credits, a more intimate knowledge of the country's requirements, greater business capacity and a little higher standard of business integrity are among the considerations which make more business with less money possible. The abounding confidence of the people in themselves and in the future of the country ought not to be lost sight of in making up the account. There is an extraordinary demand for American breadstuffs and provisions, as well as cotton and petroleum, and a great increase in the demand for American machinery, implements and tools. On the other hand, the cost of living is declining, and the worst complaint which many flour-manufacturers and provision-dealers have to make is that the accumulated stocks make large margins impossible. In the labor field, the latest developments would seem to point to a determination upon the part or the more radical leaders to precipitate a fight at all hazards. It is barely possible that the more conservative sentiment prevailing among the great majority of laborers would prevent a general strike, but this conservative element is frequently led at the heels of the few. Herein lies the danger. The master-builders, so far as they have spoken, will individually and collectively resist all forcible efforts to reduce the normal working-day to eight hours. They argue that there is need of all the labor which nine hours can give; that advantage ought to be taken of the present exceptional opportunities; that the shorter day will naturally come when the conditions are ripe. It is well that the agitation has set in in earnest so early, because second thoughts among workingmen are generally the best, and by the time the spring trade opens they will have had the opportunity of dispassionately considering all the risks and disadvantages, as well as advantages, of the proposed movement. It is recognized that widespread success would stimulate labor organization and lead to demands of various kinds, and create entanglements which it would be disagreeable to encounter. It is the sense of this that has drawn so many employers together.

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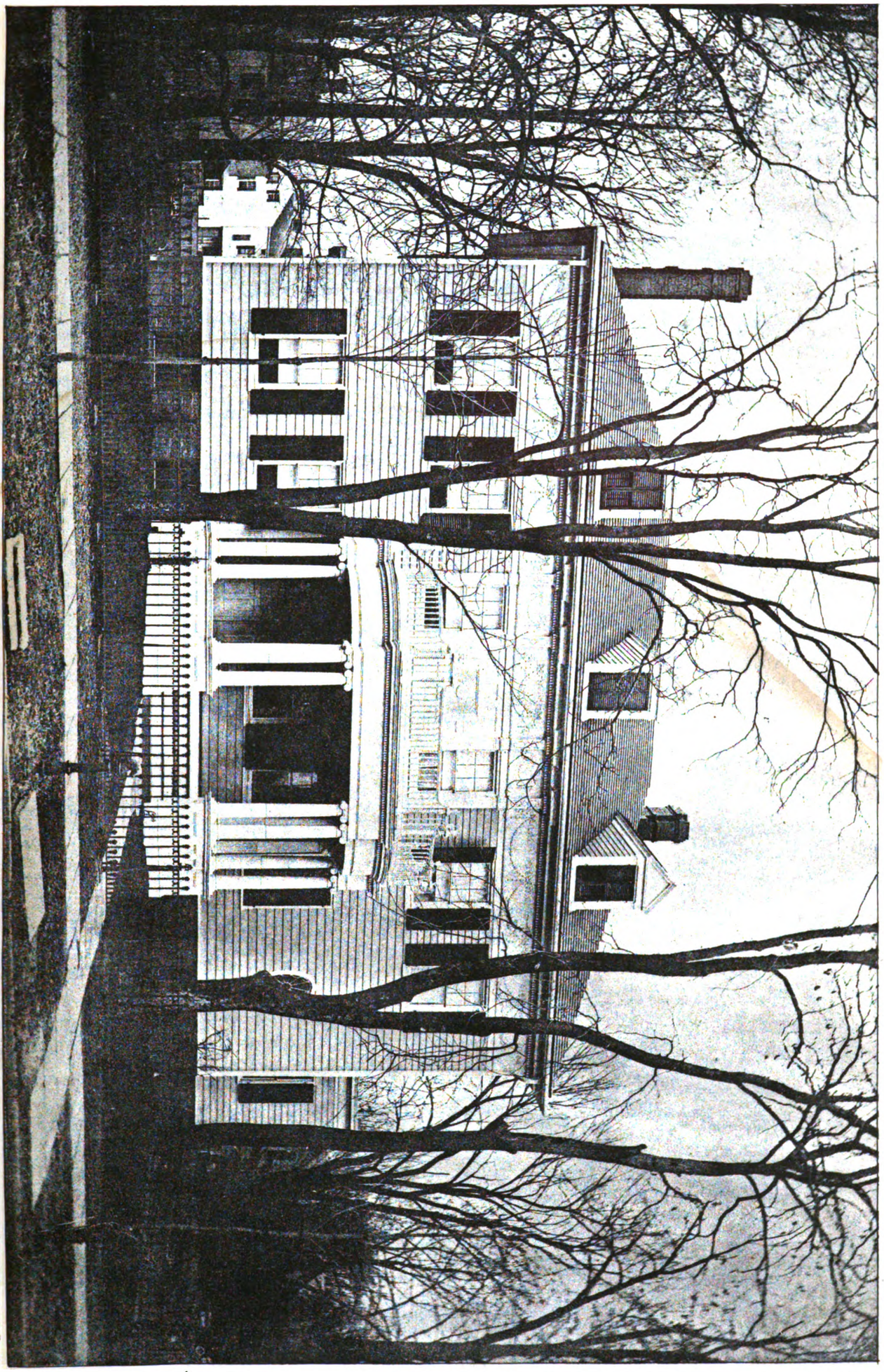

HOUSE OF PROF. C. E. HART, NEW BRUNSWICK, N.J. HENRY RUTGERS MARSHALL, ARCHITECT.

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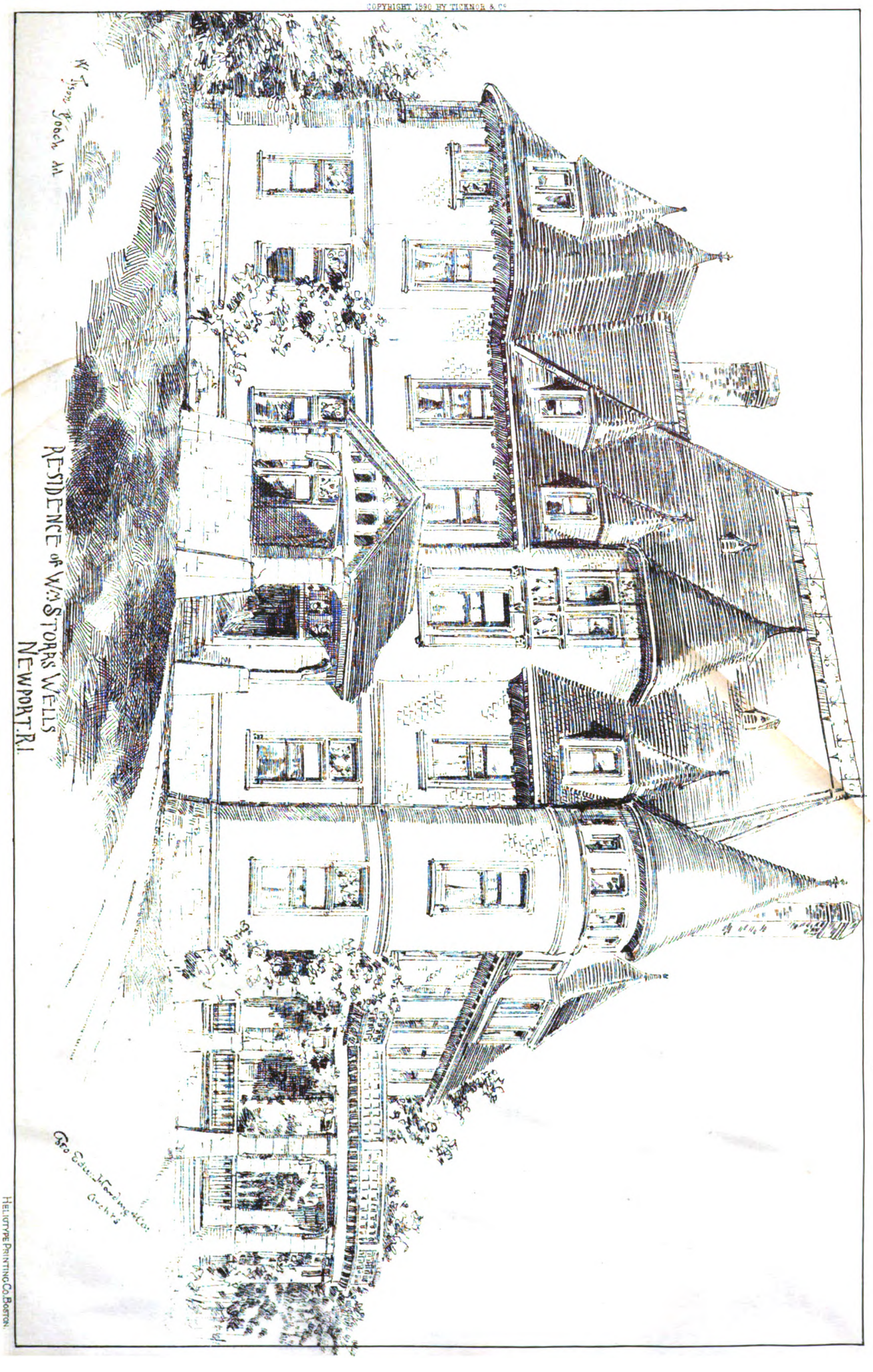

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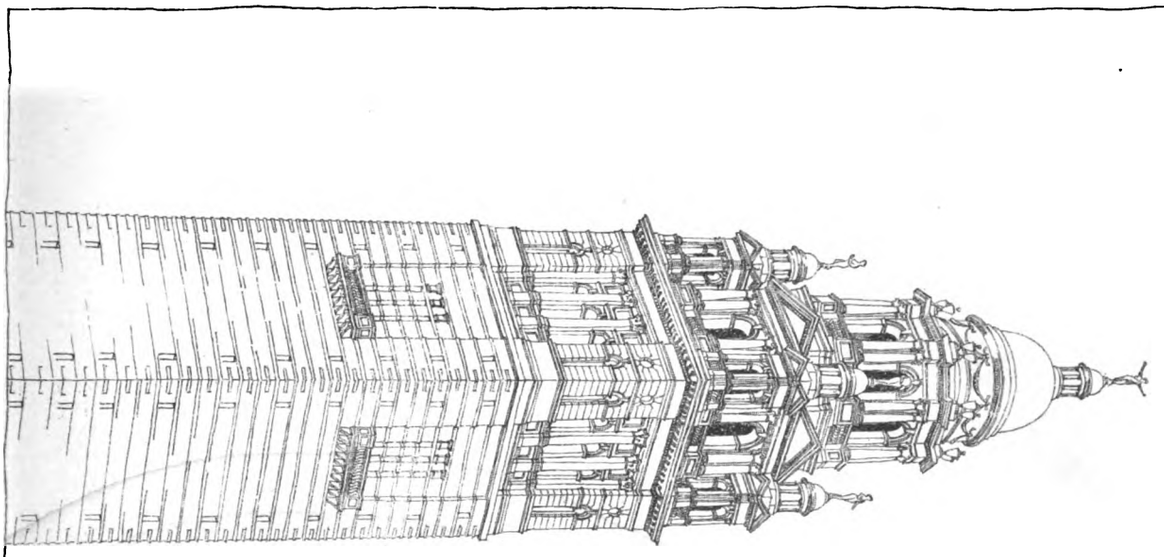

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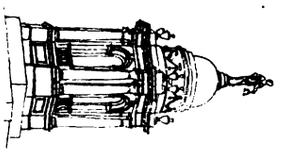

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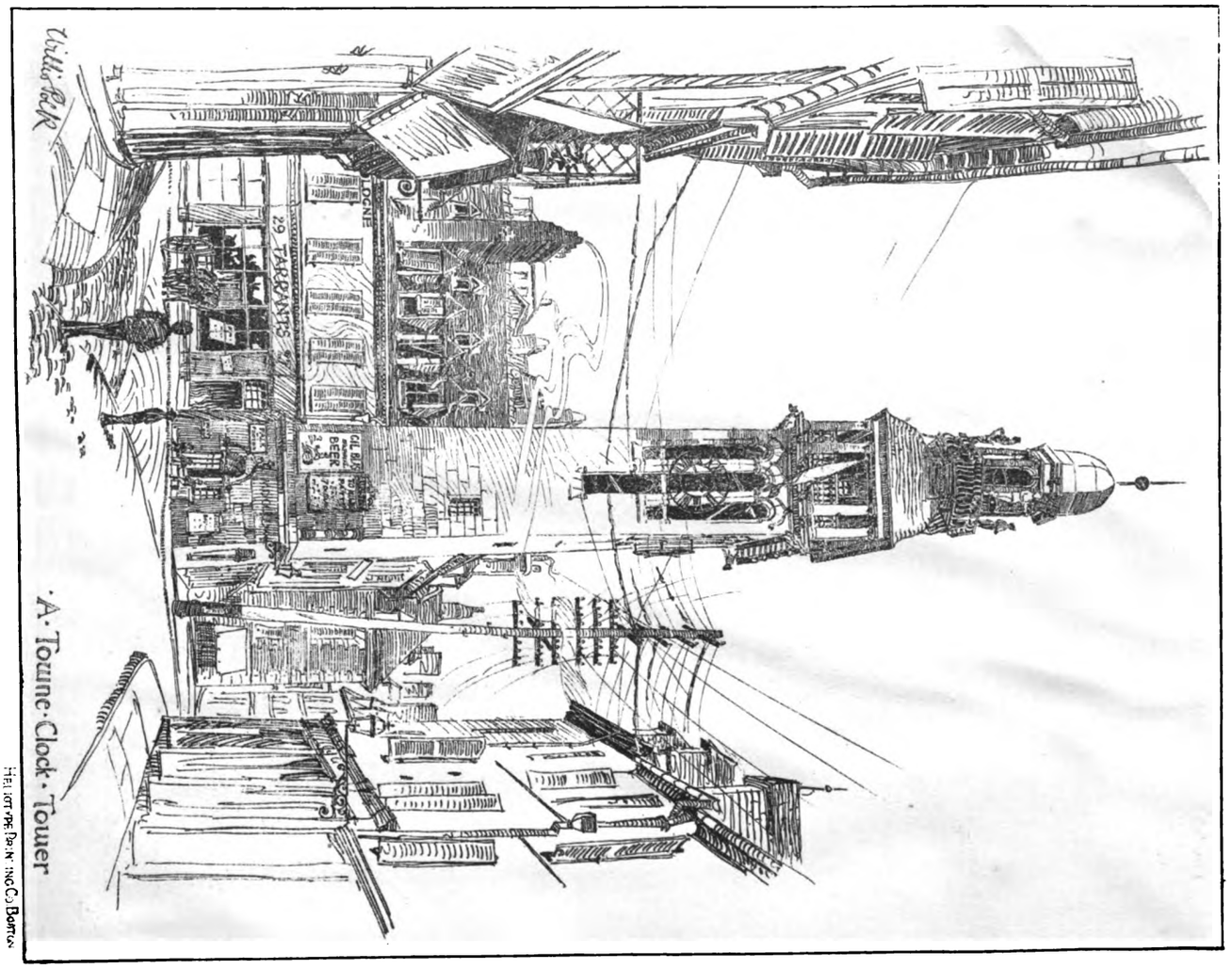

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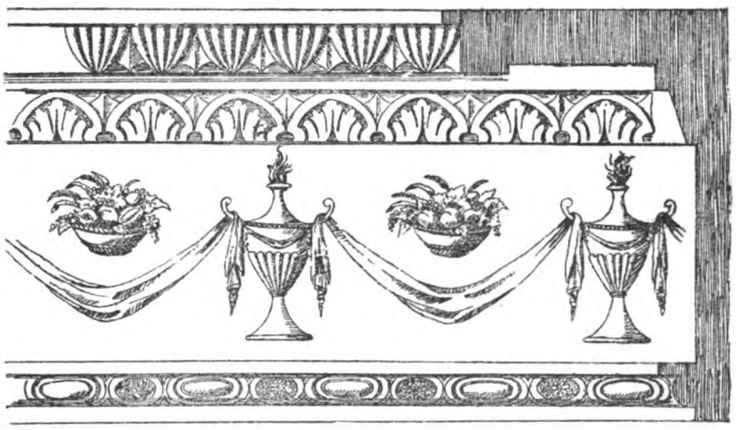

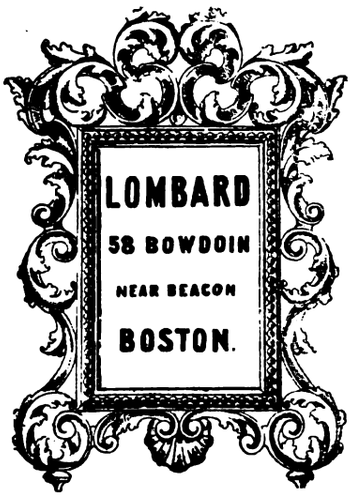

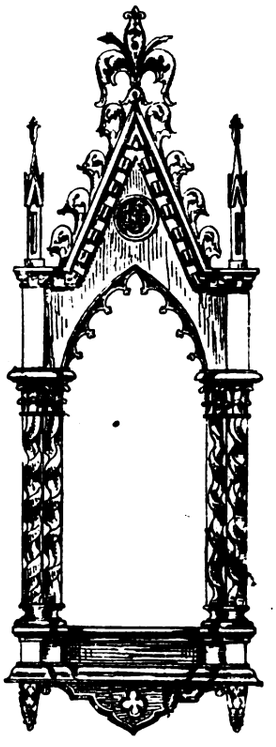

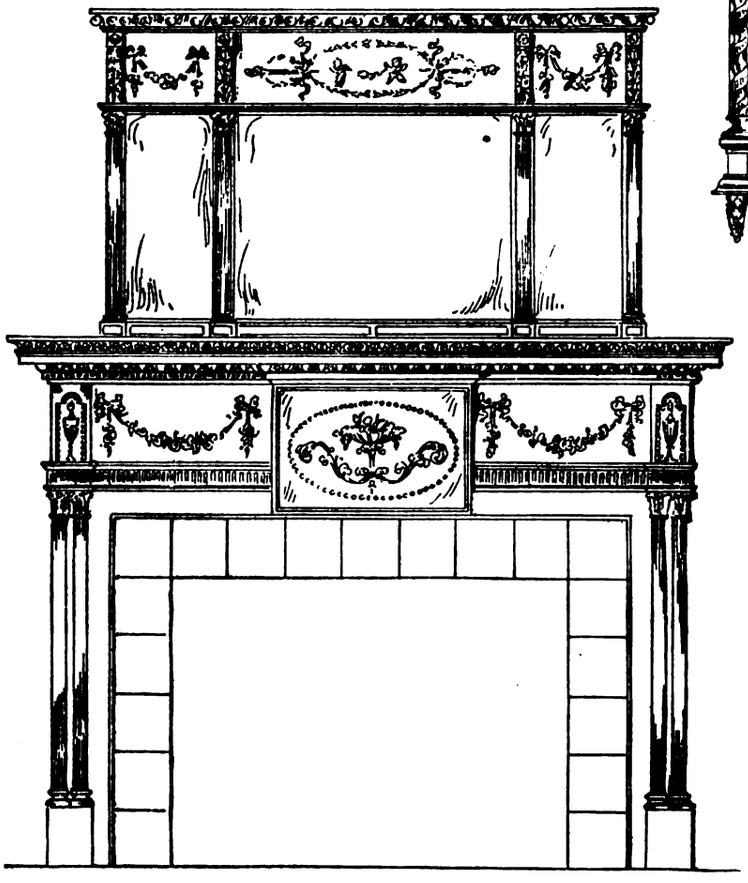

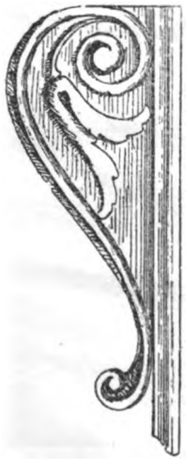

TRADE SUPPLEMENT.

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DESIGNS FOR STAINED GLASS WINDOWS.

ST. PAUL'S CATHEDRAL BUFFALO N.Y.

J. & R. LAMB, 59 CARMINE ST. NEW YORK, N.Y.

DESIGN A. IN TRANSEPT.

NORTH SIDE OF CHAPEL.

DESIGN B. IN TRANSEPT.

DESIGN C. IN CHANCEL.

ROSE WINDOW. NORTH AND SOUTH GABLES.

WINDOWS IN CLERESTORY.

DESIGN D. IN CHANCEL.

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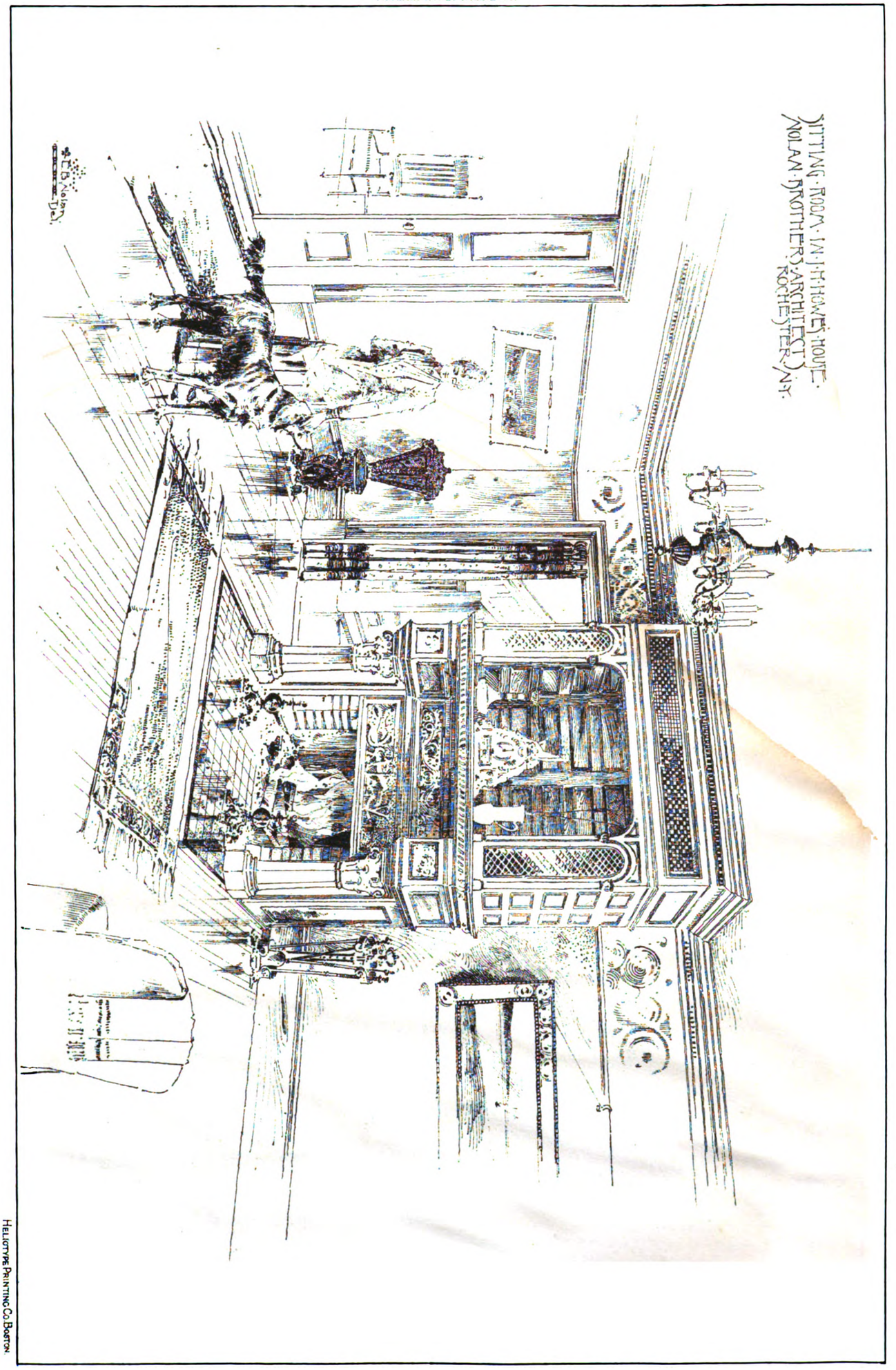

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FEBRUARY 8, 1890.

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THE Convention of the National Master-Builders' Association at St. Paul appears to have been a very successful one. From the reports in the local newspapers we gather that the most noticeable feature of the meeting was the reading of a paper by Mr. Richard Deeves, of New York, on "Industrial Education," in which he denounced, with characteristic energy and courage, the action of certain labor-organizations, in limiting the number of apprentices in the shops, as a crime against American principles and American youth. Colonel Auchmuty has, on several occasions, given expression to the common opinion on the subject of persons outside the trades, but Mr. Deeves appears to have been the first man immediately concerned with the Unions, and to a considerable extent dependent on them, who has dared to stand up for a principle against them, and, according to the St. Paul papers, there were, among the builders who listened to him, a good many expressions of surprise at his audacity. Some sensible resolutions were adopted, advising local associations, in view of the uncertainties arising from the eight-hour agitation in many States, to adopt the system of payment by the hour; and a report was presented, advising that no change should at present be made in the standard form of contract, which, we hope erroneously, is said to be now in very general use. As our readers know, we desire nothing more ardently than to see a form of contract universally adopted which shall define the rights and duties of owner, builder and architect so clearly that the province of each shall be perfectly distinct, and that there shall be no possibility of mistake as to the meaning of a single word or sentence in the whole document; and it is precisely because the standard contract, in its present form, confuses the architect and the owner, and leaves the reader uncertain as to some of the most important duties of all the persons concerned, that we wish to see it revised without delay, and believe that, as it now exists, it is framed in the interest neither of builders, architects nor owners, but solely of the lawyers, who will, if it is generally adopted, before long be reaping a rich harvest out of the misunderstandings to which it will inevitably give rise.

A RATHER unpromising scheme is said to be under consideration in Philadelphia, in the shape of an "American Engineering and Construction Company," which is to be formed, with a capital of one million dollars, for the purpose of "designing and constructing" all classes of engineering and architectural work. The company is to have branch offices in "every important city in the Union," and its promoters claim that it will be able to buy materials cheaper than private contractors, and to underbid them in competing for work. The stock, which is, we suspect, the important thing, is divided into ten thousand shares, of one hundred dollars, ten per cent of which is to be paid in at once, and the remainder from time to time, as the growth of business may demand. We have no unfriendly feeling toward the new enterprise, but, at the same time, we can see no prospect that it will be profitable to its stockholders. As every contractor and architect knows, the business of designing and constructing buildings can only be made to pay a profit by the exercise of the closest care, aided by skill and experience, not only in estimating, but in executing the work contracted for. To hire some one to make estimates, as the new company apparently expects to do, and, after signing contracts in accordance with them, to hire some one else to carry out the contracts, is to invite speedy ruin, whether the capital of the company is one million or ten. There are several builders in this country who use as large a capital in money as the proposed company can command, and possess a still larger capital, in the shape of honesty, skill and responsibility, proved by many years of successful business. These people, whose private estates are liable for their debts, can certainly buy materials as cheaply as a corporation with nothing in the shape of assets but unfinished, and perhaps unprofitable, contracts, and they can make them into buildings to far better advantage than a company composed of stockholders who know nothing of the business in which they have invested their money, and managed by salaried officials, whose income does not depend upon minute attention to constructive details, even if their training would fit them for such work.

WE ought to notice the death of M. Eugène Oudinot, or Oudinot de la Faverie, of Paris, in his way one of the most distinguished artists in stained-glass of his day. He was trained to his profession almost from infancy, having, at the age of fifteen, entered as a pupil the workrooms of Choisy-le-Roi, then directed by M. Bontemps. Six years later he came to Paris to study under Delacroix, and in 1862 he was appointed worker in stained-glass to the City of Paris. From that time his reputation rapidly increased, both at home and abroad, and, besides innumerable works for the City of Paris and the French Government, he executed many commissions for foreign countries, among them being one or two large windows for Trinity Church, Boston. His preference was, perhaps, for Renaissance design, which he understood perfectly, and in which he could display his admirable figure-drawing. He received various public honors during his long life, which was an active one almost to the last, the colored windows made for the Palace of the Argentine Republic at the recent Exposition having been his work, although he had then reached the age of seventy-two.

THE *Builder* for January contains a paper on the planning of schools, by "a Head Master," which, together with many suggestions of value to architects interested in the planning of schools, contains the frank acknowledgment that, in the maintenance of discipline in a school, "the architect can greatly aid" the master, or "can render good discipline almost impossible." To accomplish the latter end, as he says, nothing is necessary but to build all the class-rooms in a line, connected by a narrow corridor, which should be dark, and have a few sharp turns in it. Then the classes, to get from one room to another, will have a long distance to go, and can beguile their weary way by running races, hustling, riots at the angles when two classes meet, and private bullying parties in the obscure corners, while, if the corridor is dark, the ringleaders are safe from detection. By paving the corridor with stone, the noise of feet in it will resound all over the building, and day after day, and year after year, the echoes will roar their disorderly hymn to the architect who did not know how to plan a school, and did not care to learn.

THE four chief foes to school discipline, as "the Head Master" says are, Disorder and Noise; Bullying; Petty Larceny; Indecent Writing. Inside the school-building, the two former are chiefly promoted by long, dark corridors. With

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short, wide, straight and well-lighted passageways, which can be supervised at a glance, they can easily be repressed indoors, but the scene of them may be transferred to the playground entrances, or outbuildings, and these must be arranged for easy inspection. Every corner of the playground should be visible from the head-master's room, and from some of the class-rooms; the entrances should be commanded, both from the head-master's room and the janitor's office, and the latter should be placed so that the janitor can oversee, also, the lavatories, and observe every one who enters or leaves them. The existence of the third defect in school discipline may be said to depend entirely on the architect; if he plans the wardrobes so that they can be easily observed from the class-rooms, there will be no stealing from them: if he does not do so, there will inevitably be pilfering and consequent unhappiness. To meet the fourth evil, corridors should, as before, be few in number, light, and easily supervised; and their walls, as well as those of all lavatories and closets, should be lined with glazed bricks or tiles.

AMONG the details of construction, as distinguished from those of planning, which affect school discipline, the most important are those which have to do with the suppression of noise, dust and foul air. The ideal room, in our Head-Master's opinion, would have an asphalt floor, walls of glazed brick and washable ceiling, with no mouldings, shelves, cupboards or other projections to hold dust, and the whole should be washed clean every day. In the new Ecole Monge, in Paris, which he considers the model school-house, this idea is actually carried out; and he speaks of seeing the great school dining-hall, just after a relay of boys had left their places. They had been eating at little marble tables, and, as they disappeared, a body of servants carried off the dishes; then "a mighty hydrant" was opened, and "a deluge sent flying over tables, floor and walls"; the windows were thrown open, and "crumbs, crusts, smells and foul air disappeared in one gush." "The windows were then closed, heat turned on, and in a few moments the hall was ready for another batch of diners." In regard to ventilation, he has never seen a thoroughly successful school-building, and there is no doubt that very few exist, and nearly, if not quite, all these are in the United States; but his sense of the importance of the subject is so profound that he promises architects that they can raise the efficiency of teachers at least one-fourth, and the happiness of masters and boys at least one-half, if they can build school-rooms which shall have pure air, and be at the same time free from dust and noise.

LE GENIE CIVIL gives an account of the operations of the Compagnie Générale des Asphaltes de France, which is particularly interesting just now, in view of the efforts which are being made to improve the pavements in most of our large cities. Every one knows, in general, that the asphalt used for paving the streets of London, Berlin, and, more particularly, of Paris, is a natural mixture of particles of carbonate of lime and bitumen, and that the substance is found in the neighborhood of Seyssel, among the Jura mountains, near the boundary of France and Switzerland; and that it is put down in a layer about an inch thick, on a foundation of cement concrete, by the simple process of bringing it to the ground in the shape of a brownish powder, heated to a temperature near the boiling point of water, spreading it over the concrete with shovels, tamping it with heavy iron rammers, and finally rolling it smooth, after which it is, although still warm, ready for traffic. The original idea of the asphalt pavement is generally credited to the Emperor, Napoleon III, who, in the early years of his reign, is said to have looked out anxiously for a pavement which could not be torn up and made into barricades, but the fact is that in 1850, or a little later, a part of the highway between Pontarlier and Neuchâtel, in Switzerland, was coated with asphalt by M. Mérian, a Swiss engineer, and it was not until 1856 that, under the favor of M. Alphand, the Asphalt Company began to try its pavements in Paris. The first ventures were not very successful. The asphalt, being simply an elastic skin, must be supported by a perfectly firm mass below it, or it will soon be broken through; and the earlier pavements, which were laid on a concrete made with lime, failed, by reason of the crushing of the soft foundation. This experience, joined, perhaps, with the improvement and cheapening of the manufacture of cement, soon led to the exclusion of lime from road foundations, and asphalt pavement is now always laid on cement concrete.

SO laid, it forms an elastic, impermeable pavement, free from dust or mud, which is easily washed clean, and soon dries after wetting; which offers peculiar advantages for easy and noiseless traffic, and is readily repaired, by warming fragments of itself until they fall into powder, and spreading, tamping and rolling the powder as in the case of new work. The only precaution to be observed is to see that proper materials are selected at the outset. The two principal sources of the paving asphalt are the mines of Seyssel, and of the Val de Travers, in Switzerland, near Neuchâtel. Of these, the Val de Travers mine produces a material which softens under a hot sun, and moves, under heavy traffic, into ridges; while the Seyssel mineral is harder, and less charged with bitumen. Originally, the Val de Travers asphalt was used alone, but the importance of hardening it soon became evident, and that from Seyssel is now always introduced in the proper proportion for making a mixture which will be permanently hard. Very recently, the character of the Val de Travers deposit has changed, the asphalt being found to have assumed an oily character, which renders it less suitable for paving, and the Compagnie Générale is now using, in place of it, a new asphalt from Ragusa, in Sicily, which is found much tougher and better, and, mixed with the Seyssel rock, gives extremely good results.

THE *Bautschnische Zeitschrift* has been interesting itself in the subject of contracts for building, and has published a form which it considers fairer to both owner and builder than the common one. As it claims that its own form, which makes the contractor responsible for two years after the completion of the building for all damages and expenses arising from imperfect materials or workmanship, is more favorable to the builder than the ordinary printed contracts, we infer that the ordinary German contracts must be stricter than anything known here; but they also appear to leave out a good many stipulations which we are accustomed to regard as necessary. We find, for instance, nothing said about insurance, underletting, or the completion of the work by the owner in case of the insolvency or misconduct of the builder; nor is the architect mentioned anywhere in the document. In regard, however, to the times of completion of the successive portions of the work and the payments, it is very full and strict, the builder being held to a penalty for delay of any portion, while, if the owner has not his money ready at the appointed time, the builder is at liberty either to abandon the work, or to charge the owner with interest on the deferred payments at the rate of five per cent. We doubt very much whether either of these courses would be satisfactory to the contractor, and, in fact, the whole contract has, to our mind, a rather impracticable air. The clause extending the time of completion in case of "general strikes," which, as it explains, is commonly inserted in such contracts, it purposely leaves out, for the reason, as it says, that no strike is ever "general," since there are always some independent old journeymen who will not join in any strike, and usually one or more contractors who accede to the demands of their men, and in either of these cases the strike is not "general." This appears to be a new view of the matter, and we commend it to the Master-Builders' Association for consideration.

THE *Schweizerische Bauzeitung* describes some locomotives which have been ordered by the Belgian Government to draw the new express trains between Ostend and the German frontier, which are intended to run at the rate of sixty miles an hour. Unlike, perhaps, any others yet built, the new locomotives have their four driving-wheels in the centre of their length, and a pair of small wheels at each end, the forward pair having radial axles, like those of the six-wheel electric-cars sometimes seen here. This disposition gives, artistically, a peculiarly well-balanced and energetic air to the machine, and, as the driving-wheels are so near together as almost to touch at the circumference, the locomotive will run with perfect ease around curves of one thousand feet radius, although the length, from centre to centre of the axles of the front and rear wheels, is twenty-one feet.

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CIVIL AND DOMESTIC ARCHITECTURE.[1] — V.

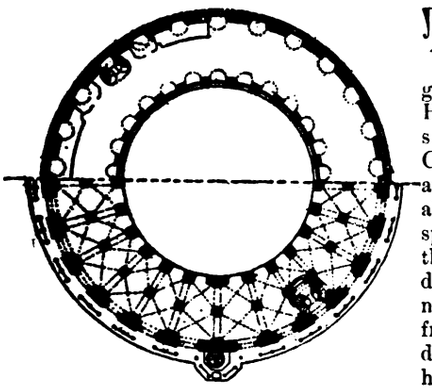

Fig. 30. Plan of the Halle aux Blés, Paris.

THE transformation in private houses which we saw beginning with the Hôtel Rambouillet still continued. Changes in manners and social customs always bring corresponding changes in the arrangement of dwellings. The Renaissance, already freed from the care of defending the homes, had allowed light and air to enter them. But the refinements and elegancies of the new society soon demanded designs better adapted to meet the new wants — designs at once more imposing and more convenient. In mansions, the principal building stood between a court and a garden; on the sides of the court the servants' quarters and out-buildings were located, and the main edifice was divided into reception-rooms and living-rooms; the first were on the ground-floor, and had access to the garden, while the others in the story above provided comforts and admitted of pursuits unknown until then.

The dwellings of the *bourgeoisie* were more and more neglected, at least in the interiors. More attention was given to the external appearances, for an ugly façade might shock the sensibilities of the great and impair the beauty of the city. As for the interior arrangement, what mattered that in a society where the *bourgeoisie* counted for naught?

The same comforts, the same symmetry of arrangement within and without, existed in the castles as in the mansions. They were of monumental aspect, with their lofty roofs and their encircling moats, the survival of ancient traditions.

A large number of castles and mansions were erected in the seventeenth century.

With Louis XV and the somewhat licentious manners of his reign private architecture became belittled; it sought before everything else the comfortable, the pretty, the pleasing. Public edifices, on the contrary, preserved the imposing character of the monuments of the preceding century, for the architects charged with their construction refused to bow to the caprices of fashion. Gabriel was one of the most earnest of these defenders of Classic art. The Military School, which he began in 1752, recalls the style of Mansart and Perrault,

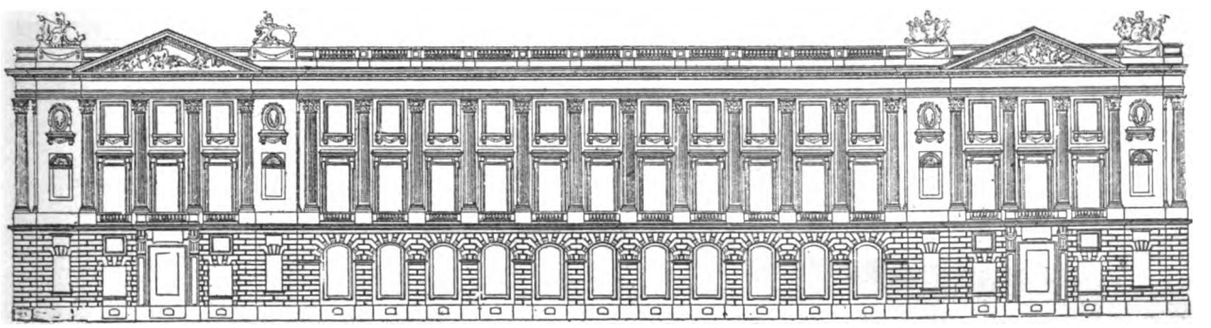

Fig. 25. The Garde-Meuble, Paris.

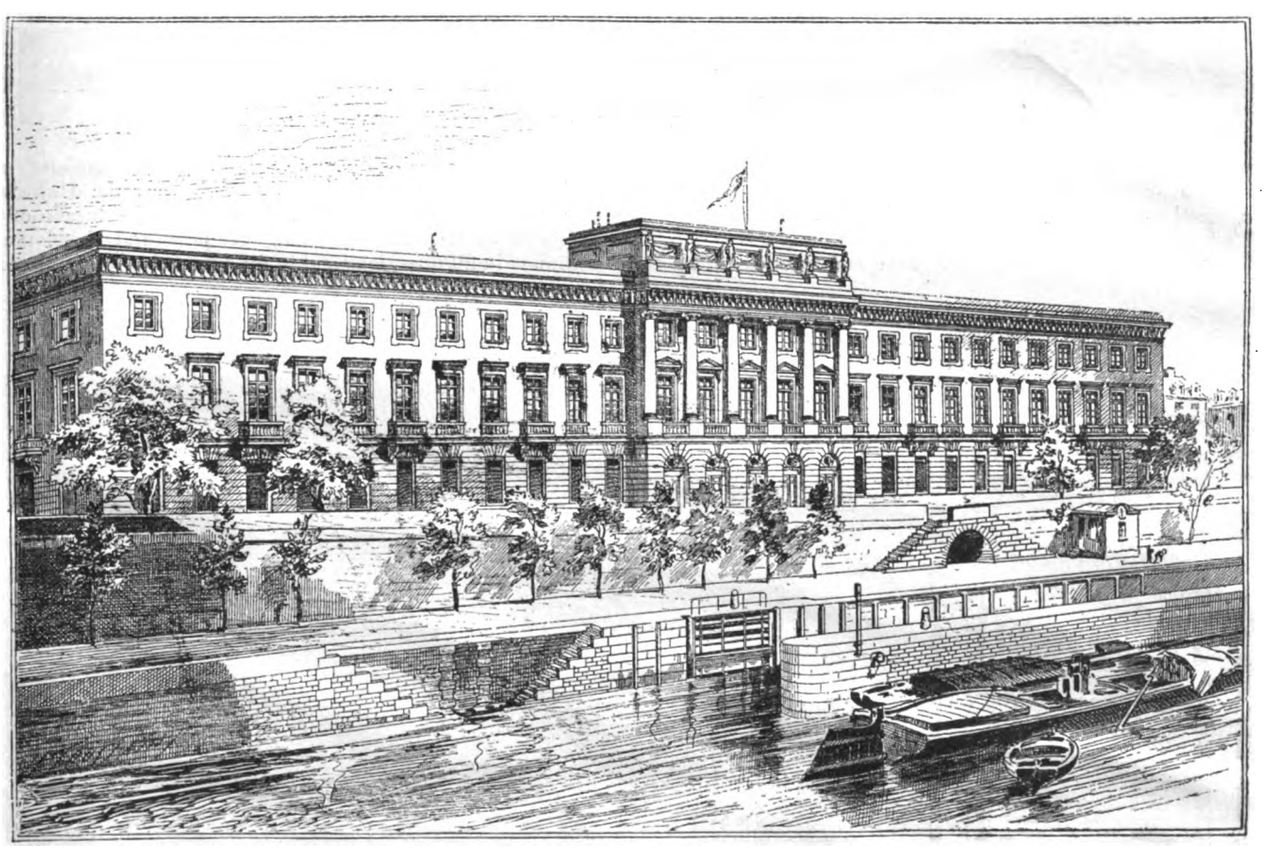

Fig. 26. The Mint, Paris.

[1] From the French of G. Guicestre, in "*Encyclopédie de l'Architecture et de la Construction*." Continued from No. 736, page 72.

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with, however, a greater regard to fitness and the adaptation of architectural forms to their proper destination.

His two masterpieces were the Ministère de la Marine (Admiralty Office) and the Garde-Meuble (Furniture Repository, Fig. 25) erected on the Place de la Concorde, then Odéon was erected (Figs. 27, 28). The taste for theatres even invaded the provinces. Soufflot constructed one at Lyons, and the architect Louis erected the Grand Théâtre at Bordeaux.

Letters, sciences, commerce and law were, meanwhile, not neglected. The buildings of the Collège de France, left un-

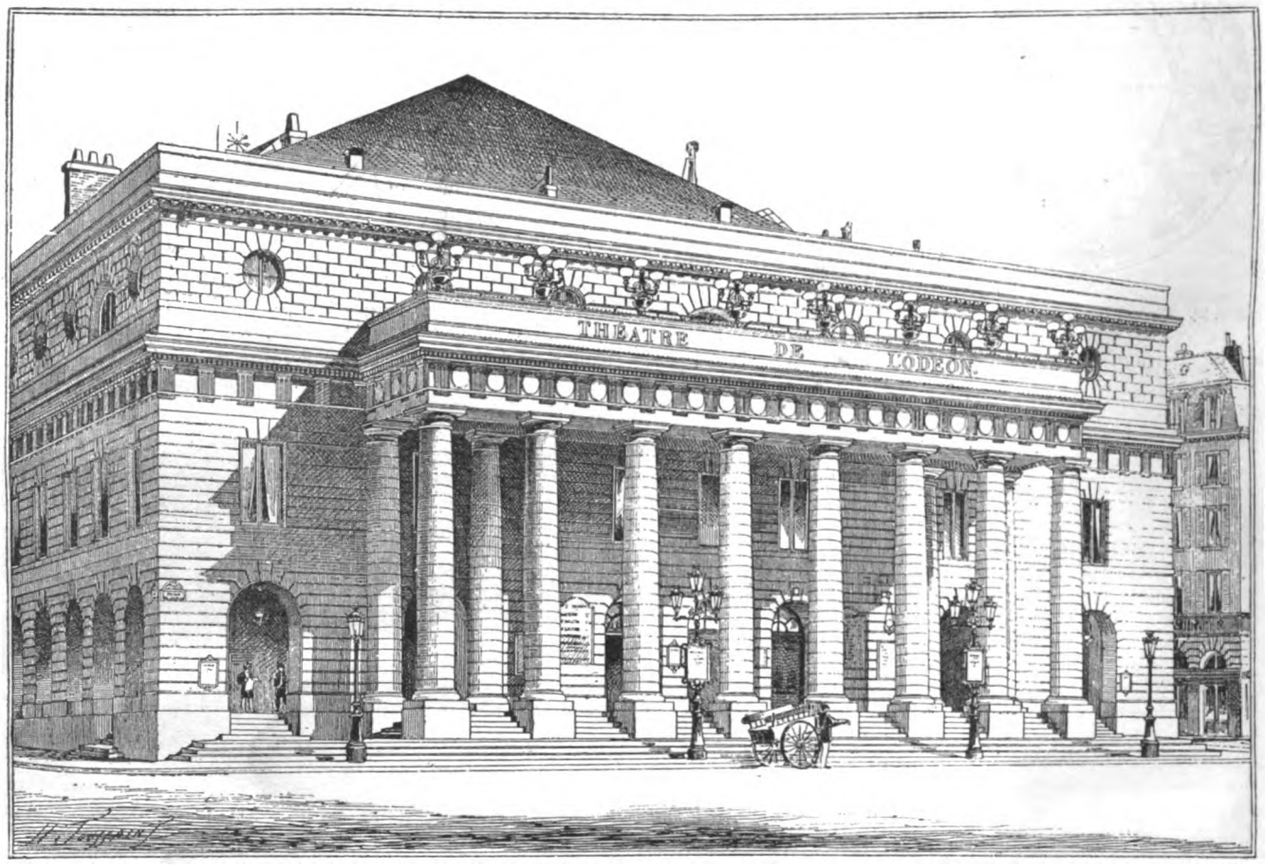

Fig. 27. The Odéon, Paris.

known as the Place Louis XV. The Château de Compiègne and the play-hall in the Palace of Versailles, which excited universal admiration, were also built by him.

The architect Antoine erected the Mint (Fig. 26).

A vast number of play-halls were constructed during the finished since the days of Louis XIII, were completed, and work was begun on the École de Médecine; the Halle aux Blés, or Corn Exchange (Figs. 29, 30), and the façade of the Palais de Justice were erected. Architectural development continued in all directions and in all branches. Paris annexed

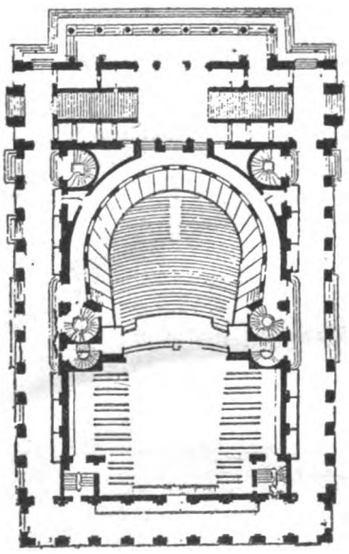

Fig. 28. Plan of the Odéon, Paris.

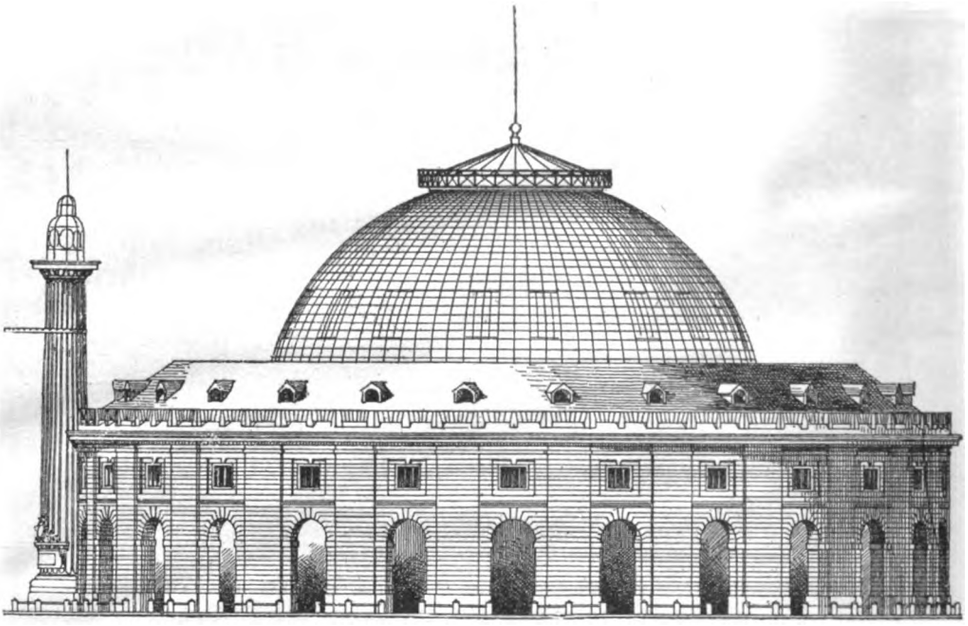

Fig. 29. Halle aux Blés, Paris.

eighteenth century. They responded too well to the tastes of the times to be neglected. The architect, Moreau, was commissioned to rebuild the Opera-house: a little later on the new quarters, which were quickly built up. At the different gates of the capital toll-houses were established under the direction of the architect Ledoux; these were of massive

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construction, with rotundas and colonnades, often in very doubtful taste. The engineer Perronnet threw across the Seine the Pont de Neuilly. Beautiful squares were laid out and surrounded by noble monuments, at Nancy (Figs. 31, 32), at Bordeaux, at Valenciennes, Rennes, Rheims and elsewhere. Attention was turned more and more to the antique. Roman edifices ceased to be the only ones studied; researches were pushed into Greece, and books appeared in which the Grecian monuments and ruins were minutely illustrated.

The Revolution did not divert this current of ideas; during its sway the style of costumes and the forms of even the smallest objects of art were borrowed from the Greeks and Romans. When the Empire came in, France believed that the days of the Roman Empire had returned; therefore, the chief aim in the construction of monuments then was the revival of Roman monumental art, and no heed was given to climatic or social differences. This was the period when Percier and Fontaine were employed to continue the Louvre and to erect "to the glory of our armies" the Arc de Triomphe du Carrousel; it is a faithful copy of the Arch of Septimius

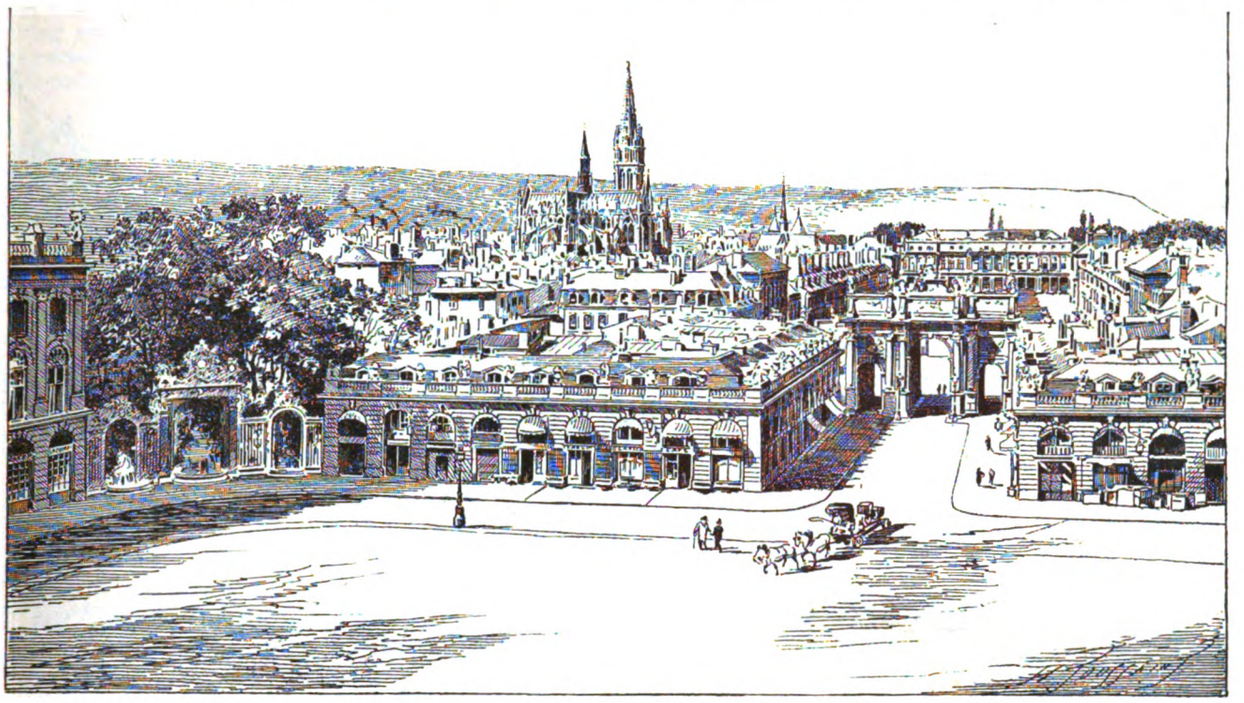

Fig. 31. Place Stanislas, Nancy.

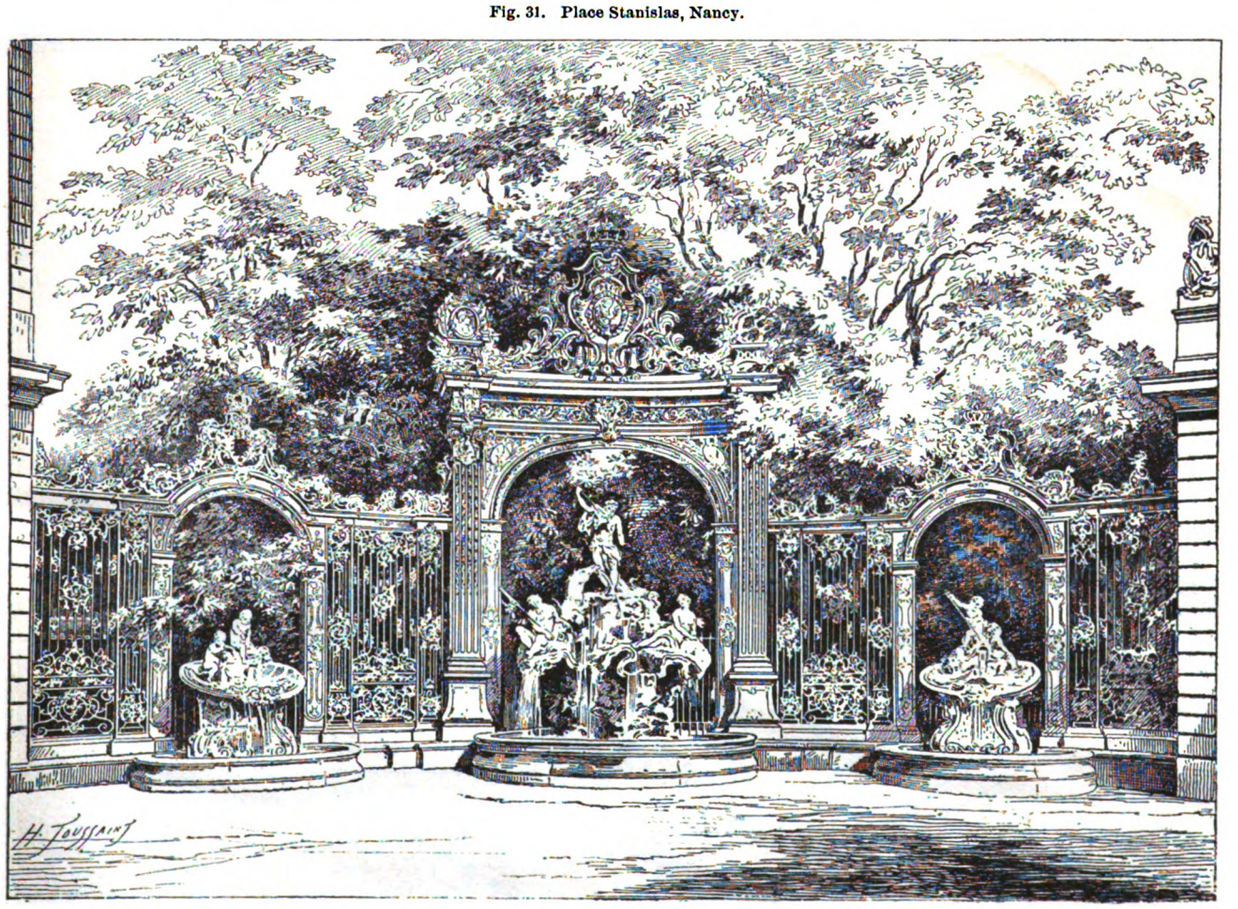

Fig. 32. Fountain of the Place Stanislas, Nancy.

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Severus in the disposition of parts and almost in its proportions, but the decorations bear evidence of a more modern spirit.

The same year (1806) which witnessed the beginning of the Arc de Triomphe de l'Étoile also saw the foundations laid for the Colonne Vendôme, an imitation of Trajan's Column. All these triumphal monuments were designed to commemorate the glory of France. It was also proposed to rear a temple to this glory on the foundations of the Church of the Madeleine, work on which had been suspended. But, on the downfall of the Empire, the famous temple was restored to its original purpose.

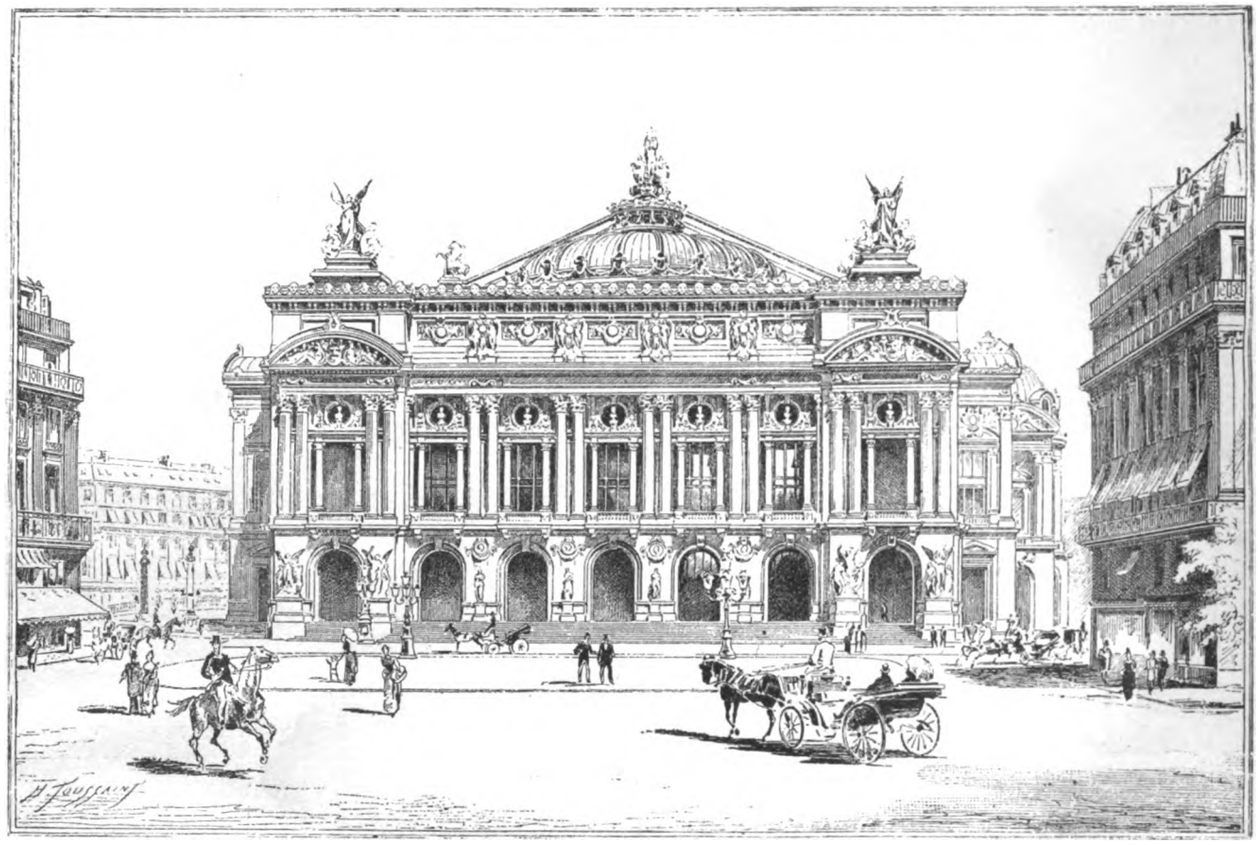

Fig. 33. Opera-house, Paris.

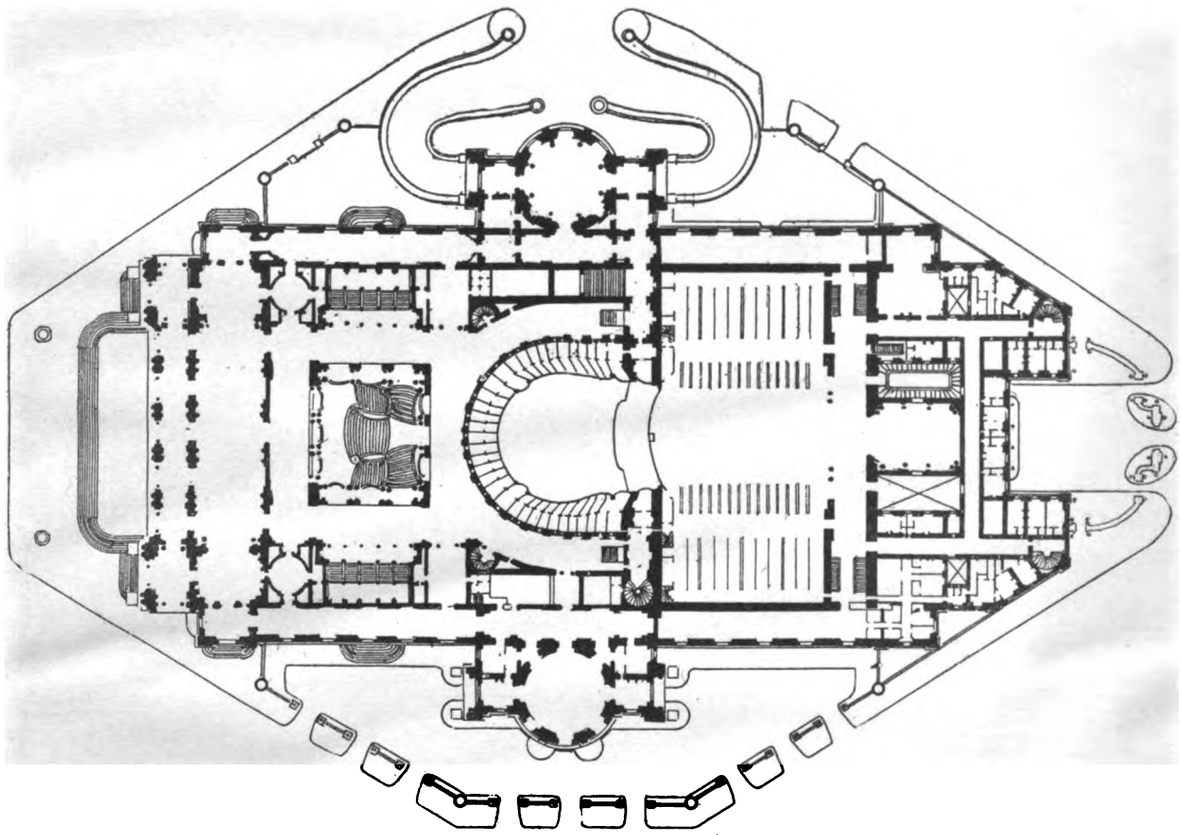

Fig. 34. Plan of Opera-house, Paris.

All the important edifices of this period are either surrounded by Corinthian porticos or adorned with peristyles of the Corinthian order. As a counterpart of the façade of the

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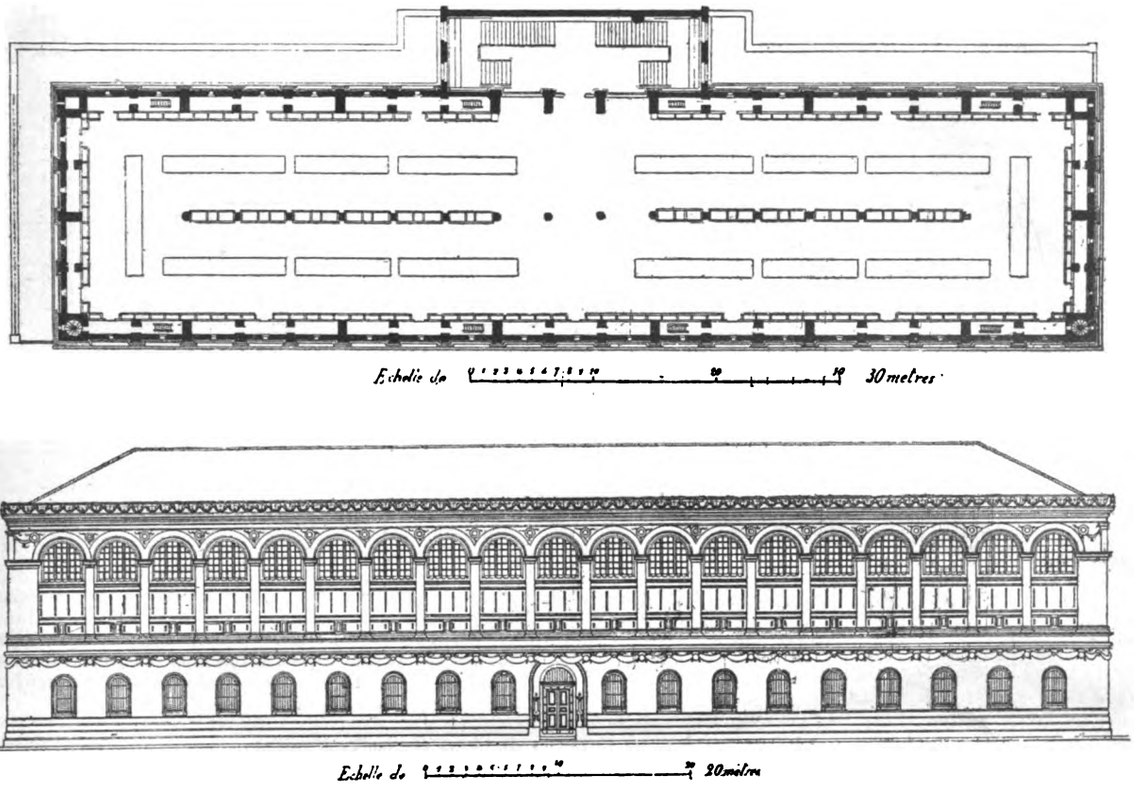
Temple of Glory we have the peristyle of the Palais Bourbon, and, in the centre of Paris, the lofty colonnade of the Bourse, a structure inspired rather by antique temples than by the Roman basilica. The Bourse proves that "Glory" did not have a monopoly of architectural genius. Napoleon, while winning battles, at the same time devoted himself to the great interests of State. A large number of public works were executed during his rule: markets, consisting of vast galleries running around a court, like the Market St. Germain, were constructed, as well as *entrepôts*, like the *entrepôt* for wines and brandies; bridges, like those of Austerlitz, Jéna, la Cité



Figs. 35 and 36. Library of Saint Geneviève, Paris.

and les Arts; canals, like those of the Ourcq and Saint Martin; reservoirs, like the Bassin de la Villette; public fountains, new sewers and cemeteries.

The Restoration presents a period of stagnation after this return to ancient traditions. It essayed the completion of the important unfinished constructions of the Empire, but no new ones were undertaken. However, with the advent of Louis Philippe to the throne and the establishment of a sound financial basis, a large number of public edifices sprang up all over France; in all these the architectural elements were borrowed from Italy. An illustrated work by Le Tarouilly, entitled "*The Edifices of Modern Rome*," had recently appeared, which powerfully influenced the architecture of this period, but the plans had to respond to new needs. The great institutions founded by Napoleon in view of the centralization of all powers had not died with the Empire. The reorganization of the political and administrative machinery, and new laws concerning public instruction, justice, the army, sanitation and public safety called for a vast number of new structures — ministerial buildings, prefectures and sub-prefectures, lyceums and colleges, communal and government schools, museums, court-houses, barracks, hospitals and prisons, and the interior arrangement in each case had to answer the needs of the time.

The Second Empire continued this work, at the same time giving it a new impulse. The external simplicity of the buildings of Louis Philippe's reign were superseded by decorations, often in bad taste, made of pilasters, escutcheons, wreaths, medallions and cartouches. Pulled about in all directions, drawn toward archæological studies by the works of De Caumont, Du Sommerard, Mérimée and Viollet-le-Duc; torn asunder by the advocates of the Classical, Neo-Grec and Gothic styles, and at war with new elements of construction, architecture struggled along, feeling its way in multitudinous attempts. In the midst of this architectural eclecticism efforts were made (and this was the real tendency) to indicate by the divisions of the façade the internal arrangements and to show the destination of the different stories in the character of the decorations and the piercing of the bays. In the Grand Opera-house, M. Charles Garnier boldly denoted in the façade the three principal divisions: foyer, audience-hall and stage (Figs. 33. 34).

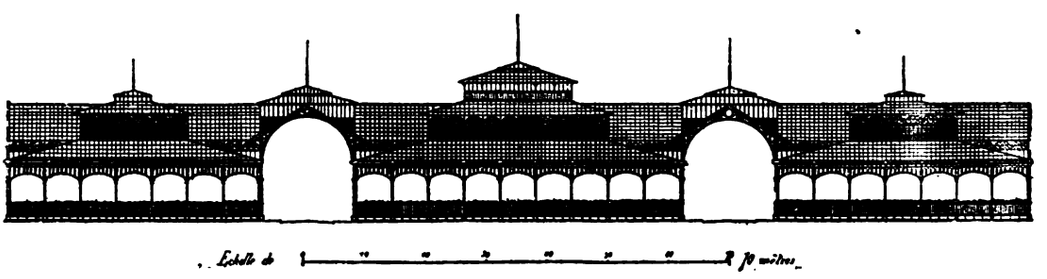


Fig. 37. Halles Centrales, Paris.

But it was notably in the interiors that modern demands had to be met, and it must be admitted that extraordinary architectural skill was displayed here. The use of iron made it possible to span wide spaces without intermediate points of support. Labrouste had already employed this material in the beautiful hall of the Library of Saint Geneviève (Figs. 35, 36), and he employed it later on in the National Library; Baltard used it exclusively in the construction of the Halles Centrales (Figs. 37, 38). Thereafter all exchanges and markets, all vast exhibition-rooms and great government halls were destined to be built of iron.

Again, the establishment of railroads called for the erection

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of structures of a special nature, and in these the use of iron became general. Such buildings as passenger-stations (Fig. 39), freight-stations, storehouses, car and locomotive shops and other buildings, all designed for special purposes, extended the realm of architecture and opened up new horizons to the art of building.

There was also a complete alteration in domestic architectural forms with the accession of the *bourgeoisie*. Instead of dwellings for a single family, the tenement-house was instituted, in which every story contained one or even several complete suites of apartments. Such buildings becoming a money investment, their construction went into the hands of speculators, who pushed the work with deplorable activity.

What will be the fate of art thrown into the power of wild speculation? No heed seems to be given to this question.

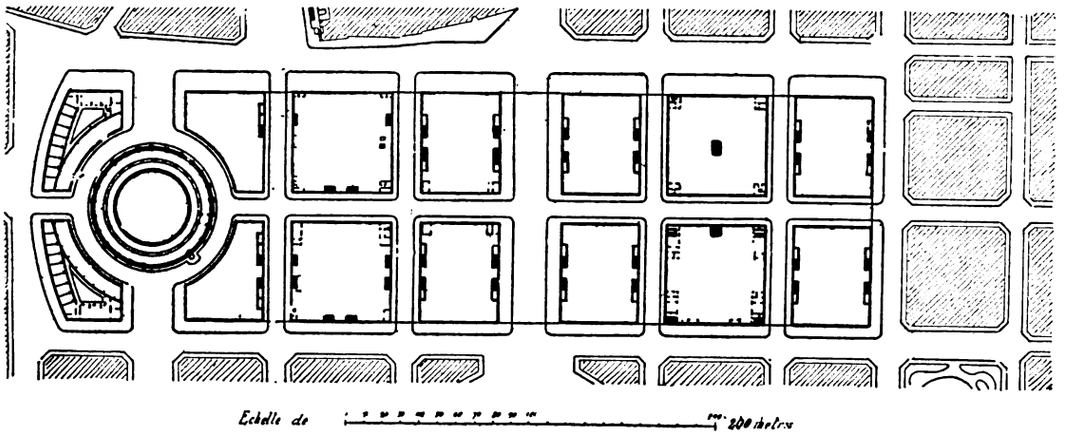

Fig. 38. Plan of the Halles Centrales, Paris.

A few artists are still to be found, who are defending the domain of domestic architecture, step by step, against the invasions of the money-making interest, and who are seeking to discover the architectural expression adapted to the needs of society as now constituted. Without yet wholly abandoning the tenement-house system, they are putting up small *hôtels*, on which much talent is exercised. Entire quarters of Paris are being covered with these pretty dwellings, which give them a unique and picturesque character. All styles are to be found there side by side, more or less happily adapted to the Parisian customs; all sorts of materials are used in the construction,

Fig. 39. Gare d' Orléans, Paris.

their varied hues glowing in the sunlight. What will be the outcome of all this effort? We must seek the answer in the future.

Civil and domestic architecture has never been called upon to respond to so many or such diverse demands as are made upon it to-day. In the past, the demands have been in most cases triumphantly met, due heed having been given to hygienic requirements, as well as to the choice of materials and fitness of arrangement. And now let greater care be exercised concerning the character to be stamped upon the exteriors; let there be a profounder study of their proportions and a purer taste in details, and the civil architecture of our time will find nothing to envy in that of past centuries.

G. Guicestre.

The Light-house at Housтholm. — The new light-house at Housтholm is the most powerful in the world. The beam is of 2,000,000 candle-power, and shows clearly at Blokhus, a distance of thirty-five miles. It is produced by arc-lamps fed by De Meriten's dynamos, driven by steam-engines. To prevent the extinction of the light through an accident to the machinery the latter is duplicated, one set coming into play should the other fail. The light is further supplemented in thick weather by two powerful sirens, or fog trumpets, working with compressed air. — *Metal Worker.*

NOTES RELATING TO CONCENTRATED RESIDENCE IN VARIOUS COUNTRIES.[1] — I

In our issue for August 10, last, we published what we understood to be a complete tabulation of the results obtained by Mr. E. T. Potter in his interesting studies on the possibilities of concentrated residences, but it seems that we were only furnished with a portion of the material and it becomes desirable to reprint it with Mr. Potter's discussion of each statement of the tabulation.

CONCENTRATION: —

1. *In Rows.*

It allows of being Built in Rows; *i. e.*, with each Dwelling enclosed between two others.

This differentiates this System from: — All "detached" or "semi-detached" dwellings, such as most Farm-houses, Country-houses, Villas, and other rural and suburban dwellings in the United States, British Kingdom and Colonies, and parts of Continental Europe.

We find the farming population of Italy, and some other parts of Continental Europe, dwelling in city-built villages and towns which often combine most of the faults of cities with but few of their advantages. In the Tyrol, large numbers of the isolated châlets are, in fact, tenement-houses containing several distinct families.

2. *In Stories.*

It allows of Placing Families one over the other in Stories.

This differentiates this System from: — All dwellings intended for but one family under one roof.

Houses, whether large or small, planned for but one family, are the rule in England, where the head of the family is also the head of the house or householder; and householders, until recently, were alone allowed to vote. But many householders take lodgers who are more or less independent, and usually occupy the best parts of the house. Where a family and servants, or a family and lodgers fill a many storied house completely, or even crowd it, there a form of concentrated residence exists. Yet a system which gives all the best parts of a house to one class and the worst parts to another, is unsuited, because of these distinctions, to general use.

HEALTH: —

3. *Direct Light.*

It gives Direct Light in every Room.

This differentiates this System from: — All dwellings which contain any rooms lighted solely from other rooms, or from "shafts" or "wells" of light.

Light and air shafts are usually, in Paris and New York, of one size throughout their height; but in Italy they often increase in width, though in an irregular way, with each story as they ascend, so as to secure more light to the rooms lighted from them. A similar careful securing of the most possible light, while giving up the least possible space, results often, in London and New York, in a similar irregular funnel-shaped cross-section to the space left for

[1] The portion of the table to which each note is an appendix is here repeated before the note.

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light and air at the backs of the houses. Such funnel-shape of the cross-section of the light and air space is usually the result of after building, of various forms of rear extension, on the ground and lower stories. In the profile of Paris attics and roof lines which, by civic requirements, are kept back to give more light in the streets, we have an example, somewhat more remote, of the same form, by first intention. An instance of this term is seen in the profile of the house tops of this System; and the space taken by the enclosed entrance-way takes the place, or rather space, of a ground-floor extension. Where stores or other large rooms occupy the ground-floor and basement, or where the plans of apartments or dwellings admit of reduction of size or number of rooms as they ascend, a further advantage can be taken of the funnel-shaped section for the light-space, giving greatest width at the top, where the light enters, and where rooms, except in elevator buildings, are least in demand.

4. *Good Air.*

It gives the best Air at the Site.

This differentiates this System from: — All dwellings which have any rooms which get air solely from other rooms, or from close-bottom courts, shafts, wells, etc.; which air is therefore liable to be foul, because stagnant, or vitiated, or bearing smells or germs of disease, etc., from other dwellings opening into the same shaft or court

The *patios* of Seville open to the street by a passage closed only with a grille, affording thereby a carefully arranged and attractive, but often deceptive, glimpse of their too-often cramped and mean interiors. The carriage courts of most fine Paris apartment-houses open to the street by driveways usually left open except at night. The absence of sun cools the air enclosed in the patio or court, so that it falls and escapes, by an outward draught, through the passage or driveway. Such a downward movement and consequent change of air is obtainable through most courts and shafts if they are left open at the bottom. But this fact, and its importance, is not generally recognized or taken advantage of.

The value of space in cities leads also to making use, on the lowest floor, of space left open in the upper stories for light and air; and the ease of lighting a single story by a skylight leads, except where hot weather is almost constant, to roofing-over such space on the lowest floor; so that the smaller courts and wells of light in Paris and many other places, usually only commence above the ground-floor. If the skylights at the bottom of the shaft or court, or any of the windows on its sides, are left open, and there is a further escape, beyond them, for the air, a downward draught is generally felt, which empties any bad air in the court into or through the apartment or dwellings to which the opened window belongs. Windows opening into such small close-bottom shafts or courts, are, therefore, in Paris, generally kept carefully closed, the air in the court or shaft being considered unhealthy. The advisability of leaving such windows open where a person is sleeping is especially to be questioned, unless indeed so strong a draught is kept passing through the shaft as to insure the constant changing of the air.

Isolated examples of inside sleeping-rooms, the result of after-building or original bad planning, are to be found, even in rural districts, in the United States, Switzerland, the Tyrol, etc.; and such rooms are numerous in the cities, and especially in the old and once fortified smaller cities of the European Continent; but, in New York, and wherever deep, close back-lots, like those in New York, have been adopted, and largely built on, such rooms tend to constitute, or already constitute, a majority of the sleeping places.

Horizontal air-ducts, separate for each dwelling and room, and affording easily controlled direct air and ventilation are shown, in connection with the bath-rooms, on an application of this System published in the *American Architect and Building News*, October 15, 1887; but are not shown, because not required, in some other applications of this System. Such ducts, for ventilation, might with great advantage, be introduced, in most cases of existing inside sleeping-rooms, bath-rooms, etc.

5. *Thorough-Draught.*

It has a through-and-through draught of air at command through every Dwelling.

This differentiates this System from: — All dwellings whose windows all face in one direction; or which from any cause, lack command, at pleasure, of a through and through draught of air.

The plans of many old palaces show suites of rooms without command of a through-and-through draught of air. In Paris, many fine apartments (*i. e.*, dwellings) have all their windows facing only on the street, and so all facing in one direction, while behind them, on the other side of their rear wall, are equally fine apartments, wholly distinct and occupied by other families, which have all their windows facing in the opposite direction, on a court or garden. Through such apartments, no thorough-draught is possible; but in the Paris climate, a degree of heat which makes thorough-draught in New York not only a luxury but often a necessity to comfort is rarely, if ever, felt. The value of thorough-draught in the further matter of ventilation, is shown by the following, extract from "The Tenement-house Problem" by the President of the Health Department of New York: "If there is not a through-and-through ventilation provided to the external air for each set of apartments, the number of cubic feet of air-space allowed for each adult is 600 cubic feet, and for children, 300 cubic feet; but, when proper means for ventilation are provided, the number of cubic feet required is reduced to 400 for adults and 200 for children." [Tenement-House Act, of 1887. Chap. 84, Sec. 664.]

6. *Sunshine.*

It gives Sunshine in every Dwelling.

This differentiates this System from: — All dwellings which, from their position or plan, are deprived of sunshine in winter, or throughout the year.

The planning of the streets which radiate like the sticks of a fan from the open plaza in front of the South Gate, the Puerta del Sol, in Madrid, secures sunshine to those streets, in succession, throughout the day; but the sun's rays are thus so nearly in line with the flat fronts of the houses that but little sunshine gets beyond their thick walls into their windows; while behind the rooms having those windows, are other rooms and other dwellings, which have windows only on courts, into which the sun, in winter, when sunshine in Madrid is most desired, rarely penetrates very far owing to the height of the houses and the obliquity of the sun's rays at that season.

This suggests that planning not to shut out sunshine must be further followed, in order to catch sunshine, by placing the windows as nearly as possible at right angles to the sun's rays at the hour and season when sunshine in a dwelling is desired; and that, further, the depth of wall, or embrasure outside a window, not so at right angles, should for a like reason, be reduced as far as safe construction will allow. Still further, where balconies are introduced, the obliquity of the sun's rays in winter is taken advantage of, where their position and projection is just such that they do not shut out sunshine in winter from the windows of the dwellings below them, yet shade those windows from the hot sun of summer, when the sun's rays at noon are nearly vertical.

7. *No Overshadowing.*

It provides against Overshadowing from similar Buildings.

(See section on a Diagram illustrating this System in the *American Architect and Building News*, October 15, 1887.)

This differentiates this System from: — All systems of planning of groups of buildings in which the prevention of harmful overshadow from similar buildings is not considered and provided against.

Apartment-houses, in the newer parts of Paris, are very generally seven stories high (if we include both ground-floor and attic) and are usually without elevators. A few having elevators exceed this height. Except in public buildings space below the sidewalk is, or was until recently, rarely used in Paris, except for storing wine, fuel, etc. In London, private houses vary greatly in height; but five and six stories above the sidewalk are common, including the attics; and in addition they have a kitchen-floor nearly, or quite, below the sidewalk level. There are many hotels and a few apartment-houses in London which have elevators and are far higher than elevator buildings in Paris. In New York, five stories, not including a basement partly or wholly below the sidewalk level, are very common for buildings without elevators. While buildings with elevators are often more than double that height. The general introduction of elevators, between 1860 and 1870, put an end to the limit as to height before that put on most buildings used as dwellings, by the fatigue of mounting on foot. That limit removed renders uncertain the amount of overshadowing or deprivation of sunshine, which, at any time, one building may inflict on another unless restrained by legal enactment. This led to the studies resulting in the section shown on a Diagram published in the *American Architect and Building News*, October 15, 1887, founded on the inclination of the noon shadow on December 21, at New York, and supplemented by a table of the inclinations of a like shadow at other principal cities.

8. *Conformable to the Health Laws of New York.*

It conforms to the Health Laws of New York.

This differentiates this System from: — All plans which, however otherwise excellent, cannot be made to conform to the letter, as well as the spirit, of the Health Ordinances of New York.

The Health Laws of New York are necessarily founded on the street and lot system, said to be adopted in 1807, and now covering most of the area of the city; and are thus, an effort to combine the unexpected and inevitable results of that system with established principles of hygience by compulsory statute, so far as they can be combined; and to prohibit such results as cannot be so combined. A great and costly police task, following on hazardous solutions of delicate and difficult problems (not present in cities where such a system of arbitrary interference with freedom of exchange in land has not been thoughtlessly adopted), is thus made necessary. All land in the city not taken for streets is divided into lots, all of one size, *viz.:* twenty-five feet front, by one hundred feet deep. The lots stand in rows, and back to back so that entrance can only be had in front. It is said that it was expected that this would give not less than one lot to each family for a house and garden. Owners could not easily alter the depth of a lot, nor readily sell off a piece at either end as that would cut off access to the rear end. So lots were, and are divided in the only way thus left, and lots of all widths of front, from twelve-and-a-half feet, or less, to twenty-five feet are common; but all these remain of their original depth. Rooms under twenty feet deep are found, in all countries, usually more profitable than those deeper. Two such rooms, back to back, so that each may have light, one with windows on the street, the other

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with windows toward the rear, are found in all countries the most convenient and profitable arrangement. But as a house, thus two such rooms deep, would leave more than half a lot one hundred feet deep vacant, a second house on the same lot, entered from a passageway through the first, soon came to be common in New York. And when, from motives of philanthropy, these rear buildings were discountenanced, because they shut out too much air from the rooms, the owners made the front house four such rooms, or more, deep; so that all but the front and rear rooms had no air or light whatever, except such as entered through the doorway. "Often there were as many as ten interior rooms, and sometimes twelve, on each floor, with no means for ventilation other than by doors leading to them from the outer rooms. At night when the rooms were occupied and privacy required the closing of the door, they were utterly dark and without means for ventilation." [Report, 1887, of President Bayles, of the New York Board of Health.]

COMFORT: —

9. *Privacy.*

It furthers the Privacy of each Dwelling by providing it with a private Dumb-waiter and, in connection, with it, two private Cellars (one for food and one for fuel), and a private clothes drying and bleaching space; by the absence of corridors; and by the prevention of overlooking from the windows of adjoining dwellings.

This differentiates this System from: — All dwellings which lack these, or compensating, aids to privacy; and differentiates it in proportion to such lack.

Most houses in Philadelphia and some other American cities, and many houses in London and elsewhere, have entrances both front and rear; the front entrance for visitors and for the principal members of the family, especially on ceremonious occasions. And the rear entrance for the taking in of supplies, the use of servants and others, and for the removal of ashes and garbage. Access to the latter is had usually from passages between the rear walls or fences of gardens and back yards, or from courts, alleys, or small streets which lie behind the larger streets on which the houses front. In New York, and with many houses in London and elsewhere, such back entrances, and passages or alleys to lead to them are unknown; and their place is usually taken by basement entrances under the main entrance of the house, and entered from a small area sunk a greater or less distance below the sidewalk level.

In the more expensive apartment-houses and flats in Paris, New York, and elsewhere, the apartments or dwellings on each floor have two entrances; access to their front entrances being given by a main staircase, and a second and smaller staircase giving access to their rear, or kitchen entrances. The less expensive apartments or flats, however, in Paris, and elsewhere, very generally have but one entrance, by which, and the staircase leading to it, all persons and supplies enter; and by this staircase all ashes and garbage must be carried out, unless, as in a very few instances in New York, a shaft or shoot is provided, down which ashes and garbage can be thrown into a common receptacle below, to which the janitor, or ash-man, has access, to carry it away.

In many New York flats a dumb-waiter takes the place of a second or service staircase, for bringing up fuel and other supplies, taking linen to and from the clothes-drying place on the roof, and for taking away ashes and garbage. A space considerably larger than is required for a good-sized dumb-waiter of this kind for the use of all the families in common, but smaller than is required for a service staircase, will give a small private dumb-waiter to each family, communicating from the dwelling with the cellars and basement, and with the clothes-drying floor, and arranged with shelves for different uses.

10. *Laundry Facilities.*

It gives private Laundry facilities to each Dwelling.

This differentiates this System from: — All dwellings which lack private facilities for washing, drying and bleaching.

The practice of washing clothing and linen in the shallow parts of rivers and in small streams, usual throughout Southern Europe, is well-known; and the lavatories of the larger cities, in which any person may, for a very trifling sum, hire the use of a little stall fitted with appliances for washing, have often been described. The publicity of the open air streams and having to wash bending over, while kneeling on the often wet soil, gravel, or stone, of the bank, or on boards or platforms laid or moored there, and the semi-publicity and sometimes rough company of the lavatories, confines the use of either mostly or entirely to poor women and professional washerwomen. Yet the best European hotels usually find it necessary to forbid ladies, who are their guests, washing and ironing in their rooms. In Paris and in many parts of the European Continent, the family washing is usually "put out." The convenience of this, for those who can afford it, is undeniable. The disadvantages — the inevitable using of the same water by successive washerwomen along a running stream, or the scant supply of water, at some seasons or on occasions, in the lavatories; the uncertainty as to contact with the clothing of others, and perhaps of diseased persons; the temptation to use chemicals which whiten but rot the linen; delay in receiving back laundry-work or the loss of some of it — are also evident and suggest providing, particulary for small and economical families, complete and private laundry facilities, even where they must be very limited in size.

In Paris, the plans, as a rule, of only a few of the most splendid private dwellings, show laundries, or laundry facilities of any kind. But the old palaces of Florence frequently show a clothes-drying loggia, under the roof, but open at the sides. Such in principle is the arrangement proposed for this System. Each family has a space divided from similar spaces by light louvre partitions that screen the view while admitting free passage of air, and can be further protected by wire netting, if required, and which are open at the end; where, too, a portion of the space is left open to the sky for bleaching. The nearly flat roofs of New York apartment and tenement houses are now very generally used for clothes-drying spaces; the different families of the house having exclusive use of the space on successive days. Civility and mutual accommodation, as well as honesty are the rule. But in bad weather, inconvenience is necessarily often felt. With small families living in small apartments, it may be often more convenient, especially where no servants are employed, to have always at command, a small well-screened private drying-loggia, and a private dumb-waiter by which the clothing and linen can be carried unseen to and from it.

The heat and other inconveniences of doing a large wash in a small tenement have led, in New York, to many of the new tenement-houses providing a laundry in common where the washing can be done. Such a laundry is readily combined with this System for those who prefer it. [See in this connection, plans for Tenement-houses by the author, described in the *New York Tribune*, December 3, 1866.]

[To be continued.]

STRAY THOUGHTS FOR YOUNG ARCHITECTS.[1]

IT is very gratifying to feel that the profession in this country was never more flourishing and promised a more satisfactory future than at the present time, and that our architecture is attracting, from all quarters of the globe, that deep interest and attention to which its great field of novelty entitles it. It is surprising how wonderfully rapidly it has advanced during the last quarter of a century.

Less than fifteen years ago we had but one purely architectural periodical published in the interest of architecture, as a stand-by to the profession. That same old periodical friend is still with us in the welcome pages of the *American Architect*, together with new and equally acceptable ones of acknowledged ability, all striving for the good and prosperity of the craft. Thirty-four years since, and the American Institute of Architects was organized with thirty-three members — for a long time, in fact until very recently, the only society of architects in this country. To-day there are many. And strong and enthusiastic should we feel with such good backing. Added to the list, coming in good array, cautiously, but resolute with confidence and hope, we celebrate the first special meeting of the new Department of Architecture of this old Brooklyn Institute.

Coming last it is expected we have learned something from the experience of others; and so we think we have. We have been gleaning all this time, that while there are many advantages in belonging to such societies as these, where men following the same vocation can enjoy the free interchange of thoughts which mould the structural beauty, and, by comparisons of appropriateness, give us courage and experience in the higher development of our art, that in order to draw still nearer to us and make more deeply interesting to the searcher after professional knowledge, the world of useful, noble things, which entwine strength with symmetry, and grace with utility, we have yet to make our efforts more practical by not overlooking those elements of our early teachings, *sine qua non* of practice,

Void over void,
Solid over solid —

An everlasting principle in building, which, when twisted into the every-day deviations of construction, is nevertheless a perversion of inherent truth and beauty.

And, again, every line we draw means something. Now, we should know what it is it means, before we make it. We gladly boast of our clever draughtsmen. We note the advancement of our art thereby. Artistically gratifying this is. But we are getting away from our usefulness, or else we are plunging into specialties. Out of the great number of young men who to-day are graduating in our polytechnic institutes, or from our offices, how few care to know how to build, how to lay out buildings, or direct their progress from trench to copings. We do not expect to find one person capable of excellence in all things, but we would like to see the pupil in architecture so taught that when his artistical pencil is portraying on paper, his practical judgment is weighing, balancing, and controlling it as well.

True nobility of character, aspiring for eminence in any profession, is never too proud to pay obeisance to the simple matter-of-fact rules which are the stepping-stones to success. Our famous men worked to win. They made their plans as well as they could,— perhaps were

[1] Paper read before the Brooklyn Institute, Department of Architecture January 22, 1890, by Walter Dickson, F. A. I. A., of New York.

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assisted. But they never lost sight of the fabric which was to majestically arise from their plans. A building to them became a great yet permanent responsibility, and *they* rarely dreamt of getting around their buildings with swallow-tail coats and ponderous walking-sticks. They wanted to see — to know — for themselves, and they did, and pushed on, engrafting with their love for their art the thousand experiences obtained from a general knowledge of the many trades they acquired, which made them in time master of the situation as far as such a thing was possible.

Now, in the course to be pursued in this Department of Architecture: Do not let us stray too far away from these practical things, which, while we desire to cultivate the very highest order of designing, drawing, or planning, are so necessary to the useful architect. For where is there a more useful man than he who can plan and intelligently direct the construction of a great and magnificent building? Let the papers to be read be plain. Let our instruction be more from objects than anything else. Let the model or the stereopticon disclose to us, almost as we would see with our own eyes, all things useful, worthy of remembrance. There is no honor in knowing or doing as much as other men, but there is honor in knowing and doing more. We must work to improve, and improve that we may work. Most men born with the ordinary faculties and endowed with the power of reasoning and discrimination can, with application, succeed in the majority of professions.

Poverty is no longer any bar to advancement when there is indefatigability, but rather a stimulus to exertion. The study of building after the approved modes and requirements is not a mystery. The rules are based on common sense, easy of analysis. There is an invincible law in every portion, and that law is simplicity. Now, to begin right is half the battle won. Let us so strive to impart to others the possibility of attaining superiority only when we have become familiar with the structural first, so that if eminence ever overtakes us, we know we have achieved it on solid ground.

SPIRES, TOWERS AND DOMES.[1] — I.

FROM the earliest recorded times the greatness of man's mind in the material world has sought expression in lofty erections. In the futile endeavors of the descendants of Noah, 2247 B. C., to outwit the anticipated wrath of an awful Deity by the erection of Babel's tower, and in the more successful efforts of mankind in other lands and in later centuries, we are conscious of the existence of a sentiment that finds expression in the erection of buildings that point upwards and away from this worldly world. China, India, Asia Minor, Northern Egypt, the Moorish lands, Italy, France, Spain, Germany, our own country have reared many and glorious examples of spire and tower design, but, strange as it may seem, we turn to Greece, the fountain-head of architectural refinement, for an example, and we find it not. The Grecians, a race gifted beyond measure, intellectual to a degree, ultra-refined, almost divine in their artistic feelings, failed to rise above the worldly horizontality of architrave and cornice.

We have seen the campanile development of Italy, with all its wealth of detail. We are familiar with the solid, sturdy growth of Gothic tower architecture in Northern Europe. We are conscious of the beauties and delicacy of the French treatment. But, with all this knowledge, where can be found towers and spires to equal in boldness of conception, grace of outline and beauty of detail the Gothic, aye, and even many of the Classic towers and spires of this our own country? The sequential development of English architecture, as exemplified in the ancient ecclesiastical buildings of the Gothic style, is exceptionally marked by the development of spire and tower design.

In reviewing the history of spires our attention for strong reasons must be confined to English forms and English construction.

The simplest form of spire conceivable is the four-sided pyramid rising from the square tower with its sides parallel to those of the tower and overhanging them, forming slightly projecting eaves upon a corbel-table. Southwell Tower is an example. In the Romanesque period the spire has its first true conception. Thaon Church, Normandy, with a masonry pyramidal termination, in height about one and one-fourth diameters, and a steeper one at Valladolid, with a height of two and one-half diameters, undoubtedly embody the spire principle.

In the Early Gothic of this country spires obtained a firm hold on English church-builders, beginning with the octagonal pyramid and its attendant broaches of masonry springing from the angles of the usually square tower and butting against the splayed side of the octagon.

From the simple broached spire we turn to an important change: instead of the spire projecting slightly beyond the faces of its tower base, it sprung from a base area entirely within the edges of the tower. This modification opened up a wide field for elaboration, which was taken full advantage of during the Decorative period. Beginning with the parapet simply, followed by a combination of parapet and broaches; parapet and pinnacles; parapet, broach and pinnacles; parapets and angle turrets, elaborated again by double pinnacles; and, finally, by the introduction of miniature flying-buttresses springing from the pinnacles or turrets, and abutting against the splayed sides of the spire. The mediæval builders in this period produced spires of complicated design and elaborate detail contrasting with the effective simplicity of the early broached spire in a very marked manner.

In the early part of the Perpendicular period, the spire had reached its highest state of development and elaboration; spires were constructed from a vertical polygonal drum standing upon a rectangular tower; the surface of the spire was in some instances enriched with cusped panelling. Crockets had free play on the minor turrets and pinnacles at the spire base and up the ribs of the spires themselves. Ornaments and features were crowded on until the zenith of spire-design was reached. Then the reaction came, and square towers were once again generally erected without the superincumbent spire. The decline did not occur, however, until some very beautiful examples of each of the different kinds here scheduled were left to tell their tale.

There are some unique combinations of spire and tower in the minor English mediæval parish-churches, among which may be mentioned an octagonal spire springing from a tower of octagonal plan from base to summit. The same accompanied with angle turrets springing directly from the ground, of which there are examples at Stanwich, Northamptonshire, and at Wickham Market, Suffolk.

It would be difficult, indeed, to specify the date of the erection of the earlier tower in Great Britain, and what were the exact reasons that prompted its erection. Reasoning upon probabilities, we may arrive at a tolerably reliable conclusion in the latter case.

The tower, rising as it does above the general height of the buildings reserved for the common use of mankind, possesses physical pre-eminence which naturally suggests its erection in those positions and amongst those buildings which require accentuation either to indicate their positions from afar or to testify to their public or private importance.

The towers of mediæval times in secular buildings served for a look-out, as a refuge, and as a place of vantage in troublous times. There are a few ecclesiastical towers having some quaint legends and curious histories associated with them. Of these the tower of Boston Church, Lincolnshire, (in itself a magnificent example) has been immortalized by the writings of Jean Ingelow: in romantic verse the poetess has told of the pealing forth of the bells in the church tower at a time of particular danger from floods. Many human beings were drowned who were not able to take advantage of the periodical warning rung out from the bells of the Boston tower.

There are numberless reasons given for the erection of towers in connection with ecclesiastical edifices. Archæologists assure us that the chief ground for erecting the tower was to procure a position for the hanging and ringing of bells. Now, it is asserted that bells of large size were not cast until a date long after large, massive and high towers had been in existence for a lengthy period. This fact rather destroys the idea of bell-raising being the prime cause for ecclesiastical tower-building. Certain it is there were many causes working together to justify the erection of towers for one or other of the purposes enumerated. Towers may form a valuable artistic addition to a fabric, and some may serve a purely utilitarian function. There is a further class, the claim of which to existence it is difficult to define.

As a nation's architecture is mostly measured by the standard of its ecclesiastical work, so must we turn for the best examples of tower-design to English and foreign minsters, priories and cathedrals. At the outset it will be well to notice the positions of the tower in regard to the body of a cathedral or minor edifice consecrated to divine worship.

In the southern countries of Europe the tower was frequently detached entirely from the main building — a notable instance being Pisa. It has been suggested that the fear of the vibration set up by bell-ringing in the tower prompted the arrangement. It is to a more powerful reason, however that we must look as the cause of so marked a feature in church planning. The builders of Italy, for instance, in erecting a tower, never appear to have been satisfied unless they produced walls ten feet thick and upwards. The excessive weight of such construction brought abnormal loads upon the foundations, producing subsidence, and it is to this fact (not fully appreciated then, nor has been properly understood since) that we must look as the reason for the isolation of the tower. A settlement (no uncommon thing) due to the great weight of the tower would have entailed disaster and ruin on the cathedral if the tower had conjoined with the general structure. A diagram on the walls with a little subsequent explanation will bear out this view.

The position over the crossing of a church, as the site of the tower, can scarcely be improved upon, combining, as it does, the

[1] A paper read by Mr. Sydney Beale before the Architectural Association, January 3.

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essential advantages of a centralized position — all the component portions of the church leading the eye of the observer up to it when seen externally. In view of the modern tendency in church planning to reserve a large congregational area about the preacher, this central tower affords every facility for the effective lighting of a portion of the church usually in the dark.

Of the important English examples of this kind that occur to the mind are the cathedrals of Salisbury, Winchester, Norwich, Worcester, Gloucester and the Abbey of St. Albans.

Although the central position for the tower possesses many advantages over any other, to the unstable manner in which central towers have been constructed has been ascribed their removal to the west end of the nave in more modern instances.

We are assured by the architectural historians that the great inconvenience to worshippers entailed by the frequent works of reparation to the central tower brought about its removal to a position less contiguous to the area reserved for service. This fact may or may not explain the adoption of the western site as a very suitable one for a single tower; the principal point in which this paper is concerned is, that the ancient builders to whom, in other directions, we owe so much, did not erect their central towers with a sufficient regard to economy of material.

The western site, on the extremity of the longitudinal central line of the nave, is a very general position for the towers of the parish churches of England. The extremities of the aisles sometimes came right up to the front or west wall of the tower, thus flanking it on both sides one story high, and in other cases the tower stands clear of the main edifice, only joined thereto on the east side. It has been advanced that this latter is the proper arrangement for a single west tower, if it is to receive its full significance and importance.

There are other less-favored positions for the tower of an ecclesiastical building that may be noted. Of these, the least objectionable one is the transept site, north or south. Of the others, the position for a single tower to be most avoided is that to the north or south of the west front.

The otherwise fine tower of St. Mary Redcliff, Bristol, is to one side of the west front.

In England's cathedral towers are exhibited the respective values of each position. Chichester, with its central and detached tower; Ely, with its central and west tower; the two transept towers of Exeter; the three or more towers of Lincoln, Durham, Wells, York, Canterbury, Peterborough and Lichfield recur to the mind as showing combinations of towers that are peculiarly successful in their architectural grandeur.

The detailed consideration of tower-design in plan, in arrangement, in roofing and in its strict architectural treatment, cannot be done justice to on this occasion, and is therefore not attempted.

Each country has some peculiarity of arrangement: Italy, its circular and polygonal plans; Germany has the characteristic oblong plan — the towers, usually extending over the whole west end of the church, have been very aptly termed narthex towers; while of English towers the great majority are square, or very nearly so, in plan.

It is not perhaps just to bring the towers of various countries into review order for critical comparison, when it is remembered upon what widely differing agents their designers have relied to produce the architectural effect of the whole.

A tower that relies for effect upon the beauty and variety of the colored marbles used in its erection and embellishment cannot be criticised from exactly the same standpoint as the tower that relies upon its fenestration for its effect, or with the tower that appeals to the eye by reason of its exceeding beauty of outline.

The one when viewed as a distant object in the landscape may well suggest the pumping-tower of a water-works, and its beauty will not be appreciated without the aid of a telescope. This tower must be viewed from the area immediately around its base, while the beauty of the other towers may be seen miles away.

We may each have our own sympathies directed towards the tower-design of a particular age, style or country. But there are good grounds, patriotism aside, for maintaining that of the towers and spires remaining from the mediæval ages, in which may be seen grand conception with artistic detail, the erections of Northwest Europe, and particularly of our own country, must stand in the first rank.

Unfortunately, many a beautiful spire has been lost to us forever, their ruin and fall arising out of ignorant construction and misuse of material — an evil extending into later and even current times.

The Norman period of English architecture is in this country looked upon with peculiar reverence, due perhaps more to its romantic associations than to its incipient beauty. Now, whatever æsthetic value there may be wrapt up in the massive grouping and rude ornamentation of Norman work, certain it is that there was in this period, and later, an extraordinary prevalence of bad construction, to which is traceable the ruin of many a fine abbey. The evil effect of it is even felt in this century, and arises in some such manner as the following: Contemporary church architecture is not much valued in these days unless a precedent can be stated for each arrangement and each detail of it. It is rank heresy to some minds if the forms and modes of construction now adopted cannot be traced to by-gone times. But the designer who draws upon mediæval ages for the basis of his nineteenth-century churches must be capable of winnowing the husks from the golden grain.

Although no constructor would in these days build up the shafted piers of a church or cathedral with a thin casing of stone, of a thickness only sufficient to work its mouldings on, and then shoot in a loose rubble core, resting content with the idea that a pier had been obtained capable of sustaining the heavy superstructure of a central tower, with the thrusts from the contiguous nave-arching, still there are many peculiarities of Norman construction and constructive principles of later styles which are even now religiously followed, and which must subsequently be attended with no less disastrous results than those chronicled.

The evil prevalent in the building of many of England's fairest abbeys, cathedrals, parish and other churches, minsters and priories, has been the dangerous overloading of foundations and subsoil bottoms.

This is true of the general body of the cathedrals the author has investigated; the weight brought by nave walls onto the foundations approaching very nearly the supporting power of the soil as far as such strength can be accurately estimated. The evil of overweighted foundations is particularly marked in the locality of the towers, and most notably when the tower is over the crossing. Such an instance was the tower of St. David's, South Wales. This tower, forty feet square, and weighing over 4,000 tons, first failed by the bodily sinkage of its western side, crushing down portions of the nave, and generally upsetting the perpendicularity of its piers. The expenditure of 11,000*l*, remedied the want of constructive knowledge on the part of the original builders of this tower.

Failure not infrequently occurred at the west tower foundations, and it will be useful to inquire what are the agents generally at work endangering the stability of great towers. Such causes as badly selected materials (as in the case of St. Michael's, Coventry), of which there is a photo on the walls, taken before its restoration, is not now dealt with. First and foremost, the most destructive agent is the great weight of masonry in the tower itself cumbering the ground unduly; this overweight being sometimes further aggravated by a tall spire of heavy construction.

The presence of timber in the foundations, occurring as piles, is serving no useful purpose whatever, but subsequently decaying and endangering the superstructure. The tower of Ely Cathedral sank six inches from some such cause, occasioning, as can well be imagined, great ruin to the adjoining wings of the western transept, one of which was taken down and the other repaired. Although no actual mishap has occurred at York, a writer in 1846, remarking on the minster of that city, chronicled the fact that the tower stood upon very rotten foundations; they crumbled away at the touch, and could be easily probed with a crowbar. The consequence was that cracks appeared in the great tower.

To explain the constructive failure of so many of our fine cathedral towers, it has been said that the Normans erected their work upon the bad foundations of the pre-existing ecclesiastical buildings. This explanation shifts the blame from the Norman builders to their predecessors in these lands, whereas, investigation of the construction and detailed calculations show that enormous weights were piled upon a small area of foundation by the Norman builders, a conclusion which rather puts the boot upon the other leg.

It is, of course, possible to build very massive masonry to a great height on ordinary soil if the weight of such construction is evenly and sufficiently distributed over the soil. But what has been the method by which the great weight of many towers had been brought onto their foundations? It has been the almost universal rule to carry central towers upon isolated piers, these piers transmitting the many thousand tons' pressure upon usually four points of small area on the cathedral site, showing in some places a weight of five tons on the square foot, and in others twenty tons. The very nature of a central tower makes it necessary to carry the upper portion upon piers; but when this is done, the piers should be joined again into a continuous construction under the ground-level by the building of inverted arches of the same width as the upper tower walls, and further, they should be bedded in a wider base of concrete to sufficiently distribute the enormous pressure from the piers of a lantern tower. Some constructors go so far as to say that wherever an arch occurs in masonry or other work which tends to throw unequal weights upon foundations, an inverted arch should be built under the ground-line for each one in the wall above. In church work this system of inverted arches should be built between all the pier bases of the nave arcading, under the chancel arch, and in any other position in which a concentration of pressure is anticipated.

It has been remarked that failure not infrequently occurred at the west tower foundations. In this position, where one would think there was no reason preventing the carrying-down of the walls continuously onto the foundation, the walls in many cases are arched over and carried upon four piers at the angles of the tower, presumably with the idea of economizing the material that has been so lavishly bestowed up above, but with the sure result of precipitating the destruction of the fabric.

Bells have always been active agents in tower-destruction, both from their weight and from the strains set up by their movement and vibration. A rule has been published with reference to the necessary thickness of tower-walls intended to support bells, and it runs: The mean internal area of a tower should be one-half the external area, and then, if well-built and of good materials, the tower will safely bear as many bells as can be hung on one level. A calculation based upon this rule for a tower, say, of 40 feet side, produces

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walls 6 feet thick, assuming its height at three or four diameters high, of which, with the weight of as many bells as can be hung on one level, will show a pressure of five tons on the square foot of soil. Add to this the possible weight of a spire, and such a pressure is put upon the foundation that it is little wonder failure ensues.

This particular rule takes no account whatever of the height to which the tower may be built.

Such rules commend themselves to the unwary by their simplicity, and yet the two or three minutes spent in a calculation of such a nature has brought about a world of anxiety, years of regret and, perhaps, professional ruin.

These errors of misjudged construction are not overrated in this paper. Examples known to the whole world testify to the truth. Whether it be the dome of St. Peter's, and the various modifications during erection that had to be made before a lantern was built to that edifice that could be relied upon not to bring the dome down with a run, the unfortunate cases of our own cathedrals or the many French and German collapses, they all point to the conclusion that the knowledge of and familiarity with the peculiarities, strength and capabilities of different materials in all the varying phases of construction is not on a par with the undoubted standard that has been attained in artistic architecture. The science of architectural construction is as far behind our excellence in æsthetic design as the medical knowledge is behind the surgical attainments of another profession.

The disparity arises in but one way. The student of architecture, either from want of guidance or from misdirection in his earliest years, attempts to produce drawings more or less artistic; he is tempted early to study the æsthetics of architecture; the study becomes engaging, even fascinating, until the whole soul is imbued with romantic tradition and architectural lore. It is easily understood how unromantic, even nauseous, the study of the science of construction and the strengths of materials, with their attendant calculations, must have become. A book of formulæ and figures is put aside with impatience, perhaps with disgust. The nourishment of practical knowledge is dropped for the narcotic of archæologism.

(To be continued.)

THE DIGHTON ROCK.

THE Royal Society of Northern Antiquaries of Copenhagen, through its Secretary, Sophus Miller, has deeded that ancient monument, Dighton Writing Rock, near Taunton, Mass., on east side of the Taunton River, in the town of Berkley, to the Old Colony Historical Society of Taunton. The deed has been formally recorded, and American savants and historians will look out for this world wonder, this tablet of fact, centuries hereafter.

Dighton Rock is of granite, 4 feet high above ground. Its length of surface is 5 feet 9 inches, its width 11 feet, and its weight ten tons. The lower part of the front of the stone is near the water. This side is covered with queer cabalistic marks and characters cut deeply, which many antiquarians and scholars believe to have been inscribed by the Norsemen under Thorfinn during their visit to America in 1008, nearly five hundred years before Columbus arrived here. In fact, this rock, of all the supposed relics of Norse origin furnishes in the estimation of the advocates of an early Scandinavian occupation of this country the best evidence in support of their claim. Many drawings of the inscriptions have been taken at various times, and some of them have been published in the most elaborate manner at Copenhagen in an elegant work on the "Antiquities of America."

The first very extended description of the rock appeared in the newspapers of America about 1807, when the traveller Kendall made a long investigation into its history. He decided then that the face of the rock toward the river was originally filled with sculptures, some of which had been worn away. The outlines were hollowed or cut in *intaglio*, and their breadth was generally less than an inch and their depth about half an inch. The whole general execution appeared to Mr. Kendall as barbarous. After viewing the rock and the sculptures, which, by the way, are so conspicuous that they were first seen from the deck of a passing vessel by the early colonists, Mr. Kendall found that the only solid history he could get concerning them was that they were found in their present place and condition by the earliest white settlers. But he found that although there was an absence of history there was not an absence of interesting conjectures, and that two opinions chiefly at that time divided the learned and the unlearned.

The unlearned believed that the rock was sculptured by the order of a pirate — "either Captain Kyd or Captain Blackbeard" — in order to mark the site of buried treasure, and the shore, the traveller found for more than a hundred fathoms on either side of the rock, had since been dug up in the hope of a discovery. The learned, Mr. Kendall wrote, are "attached to a Phœnician origin, and suspect that the Writing Rock may be a monument of the first navigators that passed the Pillars of Hercules. Indeed, they find the Pillars of Hercules among the sculptures."

Mr. Kendall at that time examined Professor Sewall's drawing of the rock, the second earliest made, and also saw the first, as well as others. He concluded that no perceptible decay had taken place in the rock for the last one hundred years, and this led him to decide that the sculptures were very ancient. He also rescued from oblivion the Indian tradition concerning the rock. This is, that in ages past a number of white men arrived in the river in a bird [boat]; that the white men took Indians into the bird as hostages; that they took fresh water for their consumption at a neighboring spring; that the Indians fell upon and slaughtered the white men at the spring; that during the fray thunder and lightning [discharge of cannon] was emitted from the bird; that the hostages escaped from the bird, and that the spring, now called White Spring, and from which there runs a brook called White Man's Brook, has its name from this event. Their inference from this tradition was that the rock, which is near the brook, is the monument of the adventure and of the slaughter of the white men of the bird.

When the Runic scholars saw the rock nearly one hundred and fifty years after Professor Sewall's first visit, they pronounced it a genuine relic. Professor Rafn, in the first flush of zealousness, gave to the world a translation of the antiquarian puzzle. He deciphered it thus:

> Thorfinn, with one hundred and fifty-one Norse seafaring men,
> took possession of this land.

The late Samuel Harris, a learned Orientalist, thought he found the Hebrew word Melek (King) in the characters on the rock. Colonel Vallancy, another scholarly man, considers the sculptures to be Scythian. Professor Magnussen supports Professor Rafn in the Runic theory.

An interesting allusion to the rock has been found in the Sloane manuscripts in the British Museum in London. In a letter to Sir Hans Sloane from Cambridge, Dec. 18, 1730, are drawings of the sculptures on the rock made by the Rev. Mr. Fisher and others, and also this statement: "There was a Tradition among ye Eldest Indians that there came a Wooden House (and men of another country in it) who fought ye Indians with mighty success. They slew their sachems. This shows that this monument was esteemed by ye Oldest Indians, not only very antique, but a work of a different nature from theirs." Advocates of the Norse theory of inscription regard this evidence as important, as it confirms their evidence, and shows that the opinion that the inscription upon the rock was not the work of Indians, was put forth more than a century before the Norse voyages to this country were discussed.

In 1857, while Ole Bull, the celebrated violinist, was in this country, Mr. Niels Arnzen of Fall River, had a long talk with him about the rock. Mr. Arnzen believed that its sculptures were made by his countrymen, the Norsemen, under Thorfinn 880 years before. He finally purchased the rock and land about it of Thomas F. Dean of Berkley for $50, for Ole Bull, who became much interested in the rock, but, not being an American citizen, could not legally hold property in this country. Subsequently Ole Bull died, and Mr. Arnzen conveyed the rock to the Royal Society of Northern Antiquaries of Copenhagen as a gift to his countrymen. In 1877 this society ceded the rock to the special charge of the Scandinavian Memorial Club of Boston, composed of antiquarians. Death decimated the last-named organization, and the few remaining members some time since recommended that the rock be conveyed to the Old Colony Historical Society, the location being within its jurisdictional limits. As a result of this recommendation, now comes the deed of final transfer from the Royal Society, accompanied by a letter from Mr. Arnzen "resigning to your care and keeping this antiquarian historic relic." The society has accepted the trust, and passed a standing vote of thanks to Mr. Arnzen.

Now the Dighton Rock is in American hands, and the attempts at the solution of its cabalistic characters will go on as before. The seamy and grim old monument, which has for so long battled with the tides of Taunton River, may yet be made to yield up to the Scandinavians its secret — may award to that race the glory of having discovered the Western Hemisphere. — *New York Times.*

SCHMIEDBARENGUSS. — Schmiedbarenguss is the inconveniently long name given to a new composite metal for which almost marvelous properties are claimed. It is composed of pig-iron, wrought-iron, copper, and aluminium bronze alloy and a flux. It is produced direct from the cupola without annealing, yet it can be welded and hammered like iron or steel and can be manufactured, it is claimed, at a less cost than malleable iron or steel castings. At a test made January 20, in Louisville, it is said to have endured a tensile strain of 18,000 pounds, per square inch, that being the limit of that machine. The new composition is the discovery of Mr. Hatzfeldt, of Newport, Ky., who has made many experiments in producing aluminium. — *Chicago Times.*

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PARIS PLASTERERS.[1]

In compliance with instructions, I visited the Paris Exhibition during the first two weeks in July for the purpose of examining and reporting upon the exhibits therein, and the methods of production generally in the French capital, in so far as they relate to plastering. The quality and extent of the work were to me a most agreeable surprise; for I found that in comparison with our own exhibitions, the art of plastering, and its very general application throughout the Paris Exhibition, forced on me the impression of a sudden and complete development of a hitherto unused, or, when used, a much abused craft, so far as our exhibitions were concerned. There may have been reasons dictated by finance to account for the meagre, raw, and even repellent aspect of the miserable shanties we erected to house the good things in arts and manufactures which we invited the producers to contribute to, and the whole world to come and see, but in the future these reasons should vanish in the presence of such grand and beautiful structures as those erected on the Champ de Mars to give habitation and a fitting setting to the world's arts, productions and manufactures. There are two features which stand pronounced in the buildings as peculiarly their main glories, and they are the extent to which plaster in the one case, and iron in the other, are employed. Of the latter, of course, I have nothing to say here; but of the former, my only regret is that I had not more time and fuller opportunities to examine minutely in detail the various palaces, châlets, and pavilions which house the fine and domestic arts and productions of so many peoples and lands; each one being an illustration of the style peculiar to the country represented, and all (with rare exceptions) worked out in plaster by plasterers to represent not merely the architectural outlines, but also the materials used, whether in light, dark, or red stone, or various colored bricks, which require a close and technical inspection to distinguish from the materials in old and original buildings. . . .

Of plastering generally, as executed in Paris by Frenchmen, I must say that, though their methods are, or seem to be, far behind our own, they, for all that, turn out fairly good work, but with a waste of material that would soon make an English employer bankrupt. For example, I was on a scaffold where four men were employed doing a ceiling about ten feet by twelve. It was a plain ceiling, and the process was somewhat as follows: The plaster was turned out in a loose heap on the floor; two laborers — or, as they call them, companions — supplied with boxes, which contain about two bushels, half-filled two of them with water, and then added sufficient plaster to mix to a proper consistence; these boxes were then placed on the scaffold, and the plasterers began to mix with the left hand and a trowel in the right. This trowel is made of brass, in the shape of a very wide gauging trowel, about five or six inches in width, and tapering to four inches, with a length of seven or eight inches; being cut off straight, it is adapted to fit the corners of the box, and leave it clean as soon as the material begins to set. When the plaster is gauged, and while still of a thin fluid consistence, they splash it on the part they mean to cover; by the time this is done, the material begins to thicken as it begins to set, and then they take it out with the gauging trowel on to a hawk of a peculiar construction: — it has a handle about nine inches long; the board is about eight inches long, with a width of eleven inches, and the longest edges are formed of two strips of hardwood flush with the board. Having placed sufficient stuff on this to conveniently manipulate, they press the material on it against the part to be plastered, and spread it about with the flat face of the hawk, using the hard edges backward and forward to bring the work to an even surface. Two men to each box soon empty it, and by this time the companions supply them with a fresh pair of boxes, and so on until they have covered the whole, flush with a narrow strip of screed, formed by filling to a straight-edge bearing on points of the required thickness. They then start to straighten the whole surface, by scraping off all the humps which are inevitable by their method of application. For this purpose they use an instrument constructed of a stout blade about eight inches long, toothed on one edge, while the reverse edge is straight, an iron bow fastened to each end of the blade, and a handle attached to the apex of the box. With this they scrape down the inequalities, using the toothed edge till they get a fair surface, by which time the scaffold is covered deep with plaster, in which they tread about till the companions shovel it down off the scaffold. Then they use the reverse edge of the tool, and so scrape the surface to a smooth face. Of course, it can be readily understood by any one having even an elementary knowledge of the methods adopted by English plasterers, that two men could do the work of these four with more certainty of being correct, and in less time, without the waste incurred by the French system. In our case, there is art scientifically applied; theirs may be art, but without science. Their method of doing mouldings is as ours, with mould and running rules, only they use all plaster; but for the mitres they have no notion of our system of taking off the stuff while in a plastic condition with the joint rule. They, on the contrary, fill the mitre with stuff, and, with a series of tools of a plane-like form, shave the stiff stuff off till they form the moulding to a mitre, much as a mason would do with a soft stone; and, indeed, most of the men who do plastering in Paris are masons, or have been closely allied to them in their training. So much is this the case, that they form one body for all general purposes, and at the Bourse-de-Travail, or Labor Exchange, they are recognized as one trade. This may in some measure account for the apparent similarity in their methods of doing work, but I think the material somewhat readily admits of this mode of treatment. It is plaster always, and nothing but plaster, except in rare instances; and plaster of a wholly different consistency from ours, for when gauged their ordinary plaster is of a loose, granular quality, and has a somewhat soapy character in working, which makes it easy to cut and scrape, without the fear of meeting peculiarly hard nodules in the operation. So far is plaster brought into use, that not only are the interiors done with it, but also large and imposing fronts with cornices, architraves, pediments, pilasters, columns, and all the other adornments that go to make classic architecture, or the expression of the architect's ideal in any style or combination. This was a discovery for which I was wholly unprepared, as, according to our insular notions, plaster would not stand exposure. I do not know why, but plasterers here, both past and present, would laugh the idea to scorn of using plaster for outside work; and yet I have never known it fairly tried in this country, while in Paris all the houses that are built of rubble-stone are done in plaster, and stand good for many years; and the material is so cheap that, if it does fail in any way, it can be easily and cheaply renewed. I saw an illustration of this in the somewhat important Rue Pasquier, a thoroughfare that leads to the Place de la Concorde: some large and stylish houses were being re-plastered outside, and though, so far as I could see, the fronts were only a little smoke-begrimed, yet they were stripped of the entire plastering, to be done afresh in the semblance of a nice soft white stone; no paint being applied annually or bi-annually to these fronts — so much as it would cost could be saved to re-plaster them, and thus have a new front for another series of years. Lime and hair with sand, as we use them, are unknown, or nearly so, but where it might be expected that the strain of the expanding plaster would lead to cracks, as over bracketing in cornices or the like, they use a large quantity of tow in the formation of the core, which they lay about and mix in with the plaster while in a plastic condition. This tow they also use largely in the production of fibrous plaster-castings, and it has the advantage over canvas in this, that it presents no smooth regular surface from which the plaster-face may scale off by vibration or other causes.

[1] Extracted from the "*Artisan's Report to the Mansion House Committee on the Paris Exhibition*, 1889," made by Mr. T. Smyth.

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

EPISCOPAL CHURCH, WEST MEDFORD, MASS. MR. H. H. RICHARDSON, ARCHITECT.

[Gelatine Print issued only with the Imperial and International Editions.]

OLD IRON AND BRASS WORK AT PROVIDENCE, R. I.

HOUSE OF C. H. ELMENDORFF, ESQ., KEARNEY, NEB. MESSRS. FRANK, BAILEY & FARMER, ARCHITECTS, KEARNEY, NEB.

COTTAGE FOR DR. THOMAS H. WILLARD, JR., GREENVILLE, N. Y. MR. ADOLPH HAAK, ARCHITECT, NEW YORK, N. Y.

RENAISSANCE DOORWAYS, TOULOUSE, FRANCE.

This plate is copied from *L'Encyclopédie d' Architecture.*

NEW BAPTIST CHURCH, GARDINER, ME. MESSRS. STEVENS & COBB, ARCHITECTS, PORTLAND, ME.

TOWER OF ST. ETIENNE DU MONT, PARIS, FRANCE.

[Additional Illustrations in the International Edition.]

THE CLOISTER, POBLET, SPAIN.

[Gelatine Print.]

SECOND VIEW OF THE SAME.

[Gelatine Print.]

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CHURCH OF ALL SAINTS, FALMOUTH, ENG. MR. J. D. SEDDING, ARCHITECT.

NEW PREMISES, HIGH CROSS, CHESTER, ENG. MR. THOMAS M. LOCKWOOD, F. R. I. B. A., ARCHITECT, CHESTER, ENG.

THESE buildings were erected last year for his Grace the Duke of Westminster and the Corporation of Chester (who were adjoining owners), and form the corner at the High Cross in the city of Chester, where the Rows from Eastgate Street and Bridge Street meet. They are carried out in the half-timbered style so much associated with the old work in the city.

THE CHURCH OF ST. JOHN THE BAPTIST, LOWER CAVERSHAM, READING, ENG. MR. E. PRIOLEAU WARREN, ARCHITECT, LONDON, ENGLAND.

THIS church was completed and opened in the autumn of 1888. It was designed originally as a mission church, but, as the ecclesiastical centre of a rapidly-growing suburb, it is now a district church. It consists of nave, chancel and two aisles, with one transept containing choir and clergy vestries, and the unusual feature of a schoolroom over them. The walls are faced externally with snapped flints from the Reading chalk-pits, the quoins and dressings being of Bath stone. The church will seat 450 people, and was built at a total cost of about 4,000*l.*

JOSEPH MORRELL WELLS.

THE sudden death of Mr. Joseph M. Wells in New York causes not only a feeling of personal loss to his many friends, but a more widespread feeling of an irreparable loss to architecture. Few, if any, men in the country could be so ill-spared at the present time. With an active mind, analytic but never formal in its methods, constantly self-critical and as constantly creative, and with a passion for his art, he was one of the few men to whom architecture was not only serious, but worthy of all effort. Ignoring the baser and more sordid cares of his profession, he devoted his thought to the highest possible expression of the art of architecture, and did so with a power of reasoning and delicacy of perception which were rare indeed. Pursuing an intellectual method, he became naturally a classicist, but a classicist bound to no school but basing his design upon the great laws of mass and proportions. With this, he was most critical of detail, and refined and re-refined everything he touched. Architecture was to him a creed, a religion. Working as he did for Messrs. McKim, Mead & White, his work is necessarily fused with that of Mr. McKim and of Mr. White, and it is difficult to separate and individualize Mr. Wells's own work, but three buildings owe much to his touch so far as their exteriors are concerned: the New Britain Building, the Villard House and the Century Club. Of these the last-named is in process of construction, and it is characteristic of Mr. Wells's careful analysis of his own work, that but a few days before his death he was studying the projection of the keystone over the arched entrance in its relation to the length of line from the ground to the spring of the arch, and the consequent impression of strength in the arch, a subtilty that would be appreciated but by few. The New Britain Building, first story of stone with brick above, is an admirably handled, dignified façade, with a fine, heavily projecting cornice.

The Villard House is one of the most scholarly buildings in America. It is so much superior to any of its contemporaries that it seems to belong to a nobler age. It is *proprio palazzo*. While suggestions of Renaissance Rome are in it, it is very far from being a plagiarism, and has in common with all of Mr. Wells's work a marked originality. He felt it to be his best work, and he criticised it less than any of his subsequent designs.

The loss of a man who worked with such a spirit of study and of restraint, and who by his convictions was influencing all around him at a period when architectural design is in a transition state between vulgarity, ostentation, ignorance and something better, is certainly irreparable. It is a loss that will be felt more and more as time goes on.

C. H. W.

SOCIETIES

BOSTON ARCHITECTURAL CLUB. — ANNUAL EXHIBITION OF ARCHITECTURAL WORK.

THE Boston Architectural Club proposes to hold an Exhibition of Architectural Work in Horticultural Hall for three weeks, beginning May 12, 1890, and contributions are requested from all those who are interested in art and architecture.

The exhibits will be grouped as follows:

Section I. Sketches. Including work in this country and abroad, sketches of historical buildings, details, decoration, etc.; also measured drawings of old work.

Sec. II. Architectural Designs. Drawings of buildings designed by the exhibitor, either projected, in process of construction or completed, including perspectives, working-drawings, studies, scale-drawings, interiors and details.

Sec. III. Photographs of executed work. [It is requested that a sketch-plan should accompany the photographs of each building.]

Sec. IV. Interior work. Designs for furniture, decorations, carvings, ornaments, etc.

Sec. V. Special Exhibits illustrative of the allied arts. Including examples of stained-glass, decoration, artistic iron-work, gas-fixtures, furniture, carvings, etc. [The articles illustrated in this section are to be selected by the Club.]

Sec. VI. Students' work. Including the work of the students in the leading schools of architecture and design, and the work of the classes of the Boston Architectural Club.

Sec. VII. Work of the Rotch Scholarship. *Envois* of Mr. Harry Bacon, competition drawings from the present year, and selections from previous work.

Drawings to be submitted for publication in the Illustrated Catalogue must be delivered at the Club-rooms, 6 Hamilton Place, before March 15, and other contributions should be sent in not later than April 15. All work will be subject to the approval of the Committee on Reception and Awards.

A full exhibition of the best English, French, Italian, German and Spanish work is expected, and it is hoped that every city in the United States may likewise be fully represented.

By order of the Executive Committee,

R. CLIPSTON STURGIS, *Secretary.*

NOTES AND CLIPPINGS

CRUMBLING NAPLES. — The rain which fell in Naples on December 27, says a correspondent of the *Daily News*, was the most lasting and copious since 1885, when a rain-register was instituted in this city in order to calculate the capacity of the new drainage system then just commenced. The downpour of September 25, last, which did so much damage to the Riviera di Chiaia and the slope on the hill above, amounted to 2.67 inches of rain in two hours, the greatest fall till then registered; but on December 27, 4.33 inches fell in twelve hours. At the height of the storm the rain fell at the rate of nearly two inches an hour. As may be imagined, more damage was done than in September, and near the Grand Hotel the Riviera di Chiaia is again blocked by a perfect avalanche of mud. Hundreds of hillocks of the fertile earth of the Vomero, as big as haystacks, lie all along the streets for a great distance, and the *portes-cochères* of many palaces are blocked. The tramway cannot proceed beyond the Piazza Umberto, and the passengers to Posilipo have to alight, walk round by another street, and re-enter a tram waiting at some distance. Naturally carriages and omnibuses have to make a detour also, and the beautiful Riviera is at that point a scene of desolation. The cellars of the houses are full of water, and, higher up, the Piedigrotta Street has fallen in for a space of thirty square feet, leaving a hole twelve feet deep, into which unfortunately four passengers fell and received severe injuries. The steam-tram to Pozzuoli had fortunately just passed along the street before it fell in, but, of course, the tram service is stopped. There has been no time since the last devastation to provide properly for the leading off of the rain from the Vomero; and the principal blame lies with the municipality, whose engineers certainly cannot have sufficiently examined the plans for the new quarter built by the Banca Tibernia on the top of the Vomero, nor insisted that (the old water-courses being destroyed) a proper system of drainage should be carried on simultaneously with the building of the new suburb. — *The Architect.*

A PNEUMATIC STREET RAILROAD. — A street railroad about one and one-half miles long, on an entirely new principle, is being constructed in Washington, by the Judson Pneumatic Railway Company of New York. In this system, power is to be transmitted by compressed air from a central station to a series of motors placed beneath the track at intervals of about 1,500 feet. In a conduit between the rails, similar in construction to a cable-railway conduit, revolves a smooth cylinder, or series of cylinders coupled together at the ends about six inches in diameter. These cylinders are to be kept in continuous rotation by the compressed-air motors. An adjustable blade or arm projecting from the bottom of the car, and passing through the narrow slot into the conduit, carries at its end a group of friction wheels, which may be pressed down forcibly upon the upper quarter of the revolving cylinder. The plane of revolution of these friction-wheels may be changed by an ingenious device controlled by a lever, to be operated by the driver of the car. While the friction-wheels revolve in the same plane as the cylinder, the frame supporting them is at rest, but the moment the axes of the wheels are thrown out of line with that of the cylinder, by a movement of the lever, the frame is driven along the cylinder by the diagonal travel of the wheels, which is similar to that of the travelling ink-distributer on some of the old-fashioned printing-presses. The speed of the car is regulated by the angle of inclination of the friction-wheel axles, the cylinder revolving continuously in one direction at a uniform speed. — *Engineering Journal.*

GREAT CONTRACTORS. — When the great works which we call railways and which are greater in the labor expended on them than all the pyramids ever built — were first projected it was seen that a new class of builder was required, men who could carry out scientific orders on a grand scale, who could manage rough workmen in armies, who could build by the mile instead of the yard, and who could be trusted never

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to rest satisfied with unworkmanlike results. Properly speaking, according to the theorists, the work ought to have been done by coöperative clubs of navvies — workmen so called because the only great earthworks of the immediate past were canals, and those who cut them were nicknamed "navigators" — but the clubs did not exist, and, if they had existed, would not have possessed either adequate capital or sufficiently capable dictators. Committees cannot cut tunnels any more than they can command a ship. It was found, too, that little contractors wanted a big man over them. If one of them failed or proved incompetent, the entire great work was stopped; they were often almost insanely jealous of each other, and their aggregate profits were quite as heavy a burden as the fortune the big contractor might be expected to make. Shareholders are not idealists; they felt that they wanted big men as agents; and as soon as the demand became strong, big men came to the front. They came forward from every class in the country, except the highest — engineers, bridge-builders, canal-cutters, brick-makers, and a host of men even less accustomed to large work, but who felt the capacity to do it. Some succeeded and some failed, but among all the former there was, we have heard old engineers say, a strong family likeness. They were not, as a rule, what is called intellectual men, did not study books much, and did their thinking with a rapidity which nowadays would make critics doubt if they thought at all. They were not even like engineers, but more like the early Kings, or Generals of the pre-Prussian period, who knew how to make men obey, how to overcome obstacles, and how to get out of masses of laborers direct and positive results. That last, as all great engineers know, is a separate faculty, which, curiously enough, does not belong to all men who understand great works — which, for example, has not been displayed by the group of men, many of them quite exceptionally qualified in other respects, who have expended so many millions upon the Panama Canal. They were nearly all rough men, for they had to make themselves feared by multitudes to whom softness seemed a little contemptible; but they all, or at least all who succeeded, possessed two rare faculties — they could decide at once and irrevocably, and they could choose out men. — *The Spectator.*

Photographing Interiors. — Mr. G. Alpers says that gelatine plates should be exposed proportionately much longer than wet collodion ones. He had made the photograph of an interior with the aid of this last process, exposing for three hours, and he desired to reproduce this same interior on a gelatine plate which was from ten to fifteen times more sensitive. He supposed that an exposure of thirty minutes would be sufficient, but in developing he obtained almost nothing, and he was obliged to give an exposure of five hours. The author explains this singular fact as follows: Bromide of silver is much more sensitive than the iodide of the same metal to the intense rays, whilst it is not more sensitive than iodine to the very weak rays. This explains why the negative of portraits on gelatine are generally harder than those on collodion. To reproduce interiors having windows placed opposite the objective, the author covers them with red tissue paper, which he removes for a few seconds at the end of the exposure. — *Invention.*

The Proposed Mexican Congressional Palace. — Piacentini, the architect of the Palace of the Fine Arts, on the Via Nazionale, at Rome, has been commissioned by Mexico to build the Congressional Palace in Mexico City. His plan is Classical in general terms, offering galleries supported by colonnades, access to which is obtained through an entrance like an arch of triumph. The main entrance is considerably in advance of the façade of the building, where two smaller entrances, to the right and left, form with it a group bound together by large columns. — *Exchange.*

Ancient Bridges in China. — The Chinese suspension bridges, dating from the time of the Han dynasty (202 B. C. to 220 A. D.), furnish striking evidence of the early acquaintance of the Chinese with engineering science. According to the historical and geographical writers of China, it was Shang Lieng, the commander of the army under Kaen Tsu, who undertook the construction of the roads in the province of Shense, to the west of the capital, the high mountains and deep gorges of which made communication difficult, and which could be reached only by circuitous routes. At the head of an army of 10,000 workmen, Shang Lieng cut through mountains and filled up the valleys with the soil obtained from the excavations. Where, however, this was not sufficient to raise a road high enough, he built bridges resting upon abutments or projections. At other places, where the mountains were separated by deep gorges, he carried out a plan of throwing suspension-bridges stretching from one slope to the other. These bridges, appropriately called by the Chinese writers "flying" bridges, are sometimes so high as to inspire those who cross them with fear. At the present day there is still a bridge in existence in Shense 400 feet long, which stretches across a gorge of immense depth. Most of the bridges are only wide enough to allow of the passage of two mounted men, railings on both sides serving for the protection of travellers. It is not improbable that the missionaries who first reported on Chinese bridges two centuries ago gave the initiative to the construction of suspension bridges in the West.— *Iron.*

Who are the Pupils in the Training-Schools. — The statement is made that the sons of professional men are in the majority in the Philadelphia Public Manual Training-School. It is surprising to learn that while the children of artisans are striving to get into the ranks of the struggling and poorly-paid professions, the children of professional men are taking to mechanical pursuits. Prof. William L. Sayre, the principal of the school at Seventeenth and Wood Streets, states: "It is a curious fact that of the boys now in the training-school and learning the use of chisels and hammers and lathes, fully three-fourths are the sons of professional and business men. We have many sons of doctors and ministers and lawyers." Of the seventy-seven occupations recorded of parents of boys now in the middle class, fifty-four are those of professional or business men and twenty-three those of men engaged in other pursuits, of whom only fourteen are artisans. — *Pittsburgh Dispatch.*

TRADE SURVEYS

The employers' solution of the threatened difficulty with wage-workers — at least so far as the building trades are concerned — is payment by the hour. A spirit of determined opposition to the granting of demands for shorter hours at present pay has been manifested by employers in many industries, and it is safe to say that all demands for shorter hours at present pay will be determinedly met. What the outcome will be it is not easy to forecast. The labor organizations have very few leaders who control the confidence of the membership. The toilers have seen one after another of their leaders defeated and thrown aside; they have witnessed the failure of strikes where every condition seemed to assure success; they have found places which were relinquished quickly taken up at old wages, and they are now conscious of the fact that there is a very widespread indifference in their ranks with relation to the probability of success next May. The fact that wages are high, that occupation is constant, that the cost of living is declining, that the condition of the wage-worker is gradually improving and that new opportunities are rapidly developing, all help to weaken the force of a movement for a reduction of the hours of labor. The wage-workers are discovering and recognizing the fact that other influences than mere organization and organized effort are bringing about the gradual improvement which they feel and see. This eight-hour craze, however, is a pet theory and scheme with tens of thousands. The ten-hour day was barely established when labor organizers began to dream of an eight-hour day, and for two decades it has been preached and talked about until it has become a part and parcel of the laborer's creed. Meanwhile, times have been improving, pay advancing, conditions have been bettered, and the hopes and anticipations of the toilers have been realized. Notwithstanding all this a more or less general strike will be inaugurated, and no doubt a vast deal of inconvenience will be experienced by builders, contractors and employers generally. The industrial situation throughout the United States, at the opening of February, is certainly a subject for congratulation on all sides. The open winter has made employment more general. House and mill building has been undertaken upon a large scale. In New York City and throughout the State building is in a more forward state than ever before at this season. In Philadelphia 402 dwellings have been started since the opening of the year, and building sites have been purchased for brick and mortar operations far in excess of any former year. In Baltimore builders, after a year's lassitude due to previous over-activity, are once more finding a demand for house and shop space, and in addition to this schemes are bruited about, which, according to rumor, will involve the expenditure of some twenty odd million dollars for construction, the purchase of property and for damages. In Philadelphia the Reading Company expects to win its long fight for its Twelfth and Market Streets terminal station, and this means an enormous demand for iron and steel, brick, cement and general building material. In Pittsburgh a revival — if it can be so termed — is setting in in house-building and in the enlargement of manufacturing capacity. Throughout the region where natural-gas is, or is likely to be, used as a fuel, there are also great preparations in progress in the way of building manufacturing establishments for iron, steel, glass and machinery-making.

The makers of shafting and of machinery are now surrounded with work that will call for three months' production. There is an extraordinary demand for boilers and engines of small capacity, for gas-engines also and for artificial-fuel manufacturing apparatus. There is also an unusual demand for mining machinery, and this demand will probably increase, as a great deal of new mining property has been prospected during the past year. The increase in the yield of precious metals, amounting to some $14,000,000 last year over 1888, is a fair measure of the increasing activity in that direction. Besides this, there are engineering schemes almost without number. New York is getting in fighting trim for the World's Fair. It proposes to surprise the world with engineering feats in bridge-building, as well as in the perfection of rapid-transit facilites, which will anticipate public requirements by half a generation. Western cities are not far behind in these respects. The commercial features are all of a reassuring nature. If there is a scarcity of money, good financial management prevents it from showing itself. Within the past month or two there have been numerous complaints from agricultural localities concerning the difficulty of promptly obtaining loans, but this is, perhaps, more due to the unwillingness of lenders to increase loans in that direction when there are so many other more inviting opportunities. The Western railroads traversing the corn belt have been called upon with shrieks and threats to make special corn rates, so that immense stocks of that product can be emptied into the East, where there is supposed to be a market for it. It must be admitted that, from some cause or other, there is a growing discontent among large numbers of agriculturists in the Western States. In spite of the reduced freight rates and the enlarging Eastern and foreign markets for Western agricultural products, it is claimed that the struggle for existence is more bitter, and that manufacturing demand is sensibly affected; but all these statements are in the nature of allegations as yet, for which the clear proof is wanting. The growth of the agricultural interests has been rapid; vast areas have been reduced to cultivation; the product per acre has been increased; the cost of production has been decreased, and, because the market does not correspondingly expand, bitter complaints are made at the rapacity of Eastern money-lenders, at the over-charges of Western railroads, which can barely pay dividends, at Eastern manufacturing interests, which are blamed with extraordinary margins through high tariffs, and so on. These evils, if they are such, will no doubt regulate themselves, and the justice and injustice in the allegations, whatever they are, will be eliminated from the sweeping charges of corporate money-lending and manufacturing unfairness. To summarize the commercial situation: Last month, 77 railroads earned 13 per cent more than for January, 1889. The clearings of 50 cities for January showed an increase of 8 per cent in the volume of business over January, 1889. The New York banks report money easier, and the demand for commercial paper active. The export trade is phenomenally large, and the domestic trade is gaining every week.

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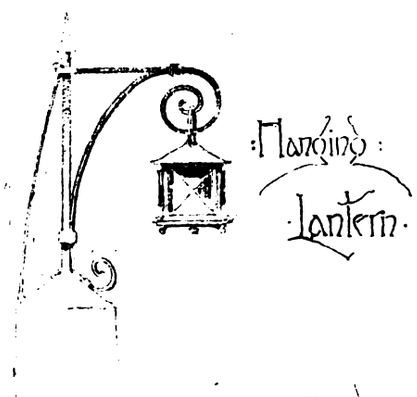
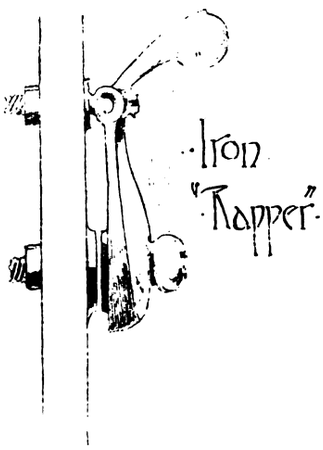
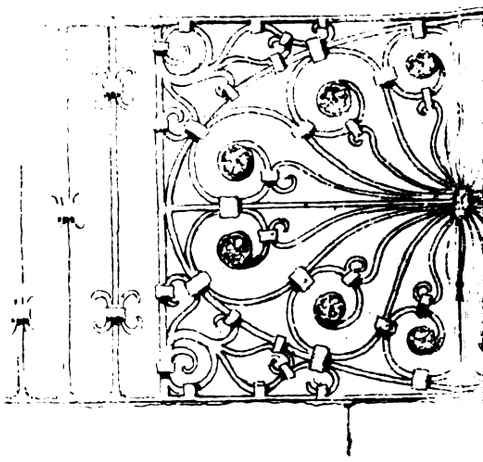
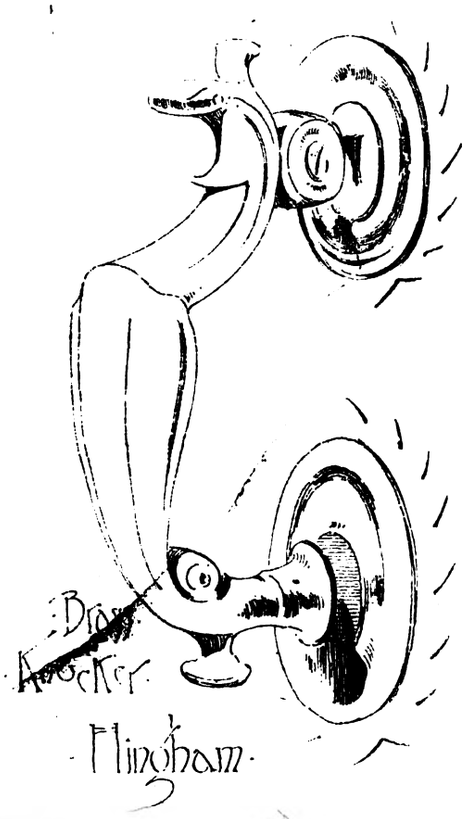


Hanging Lantern.



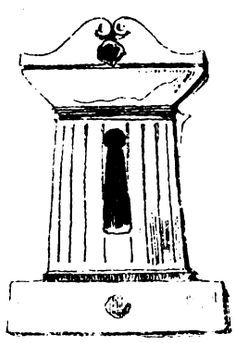
Iron "Rapper"





Brass Knocker

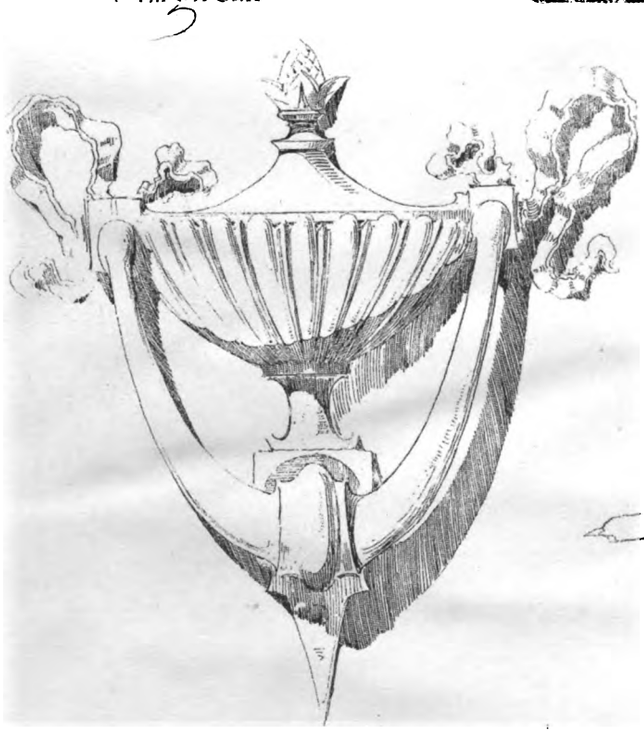
Escutcheon.



Hingham.

Old Houses

North Main



Old Iron & B

Providen

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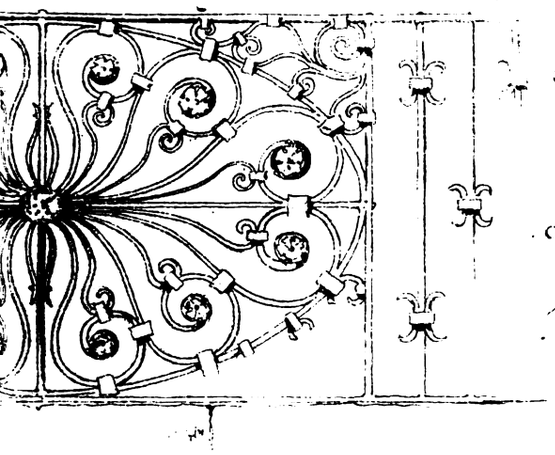
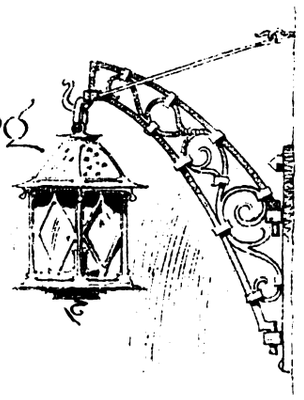
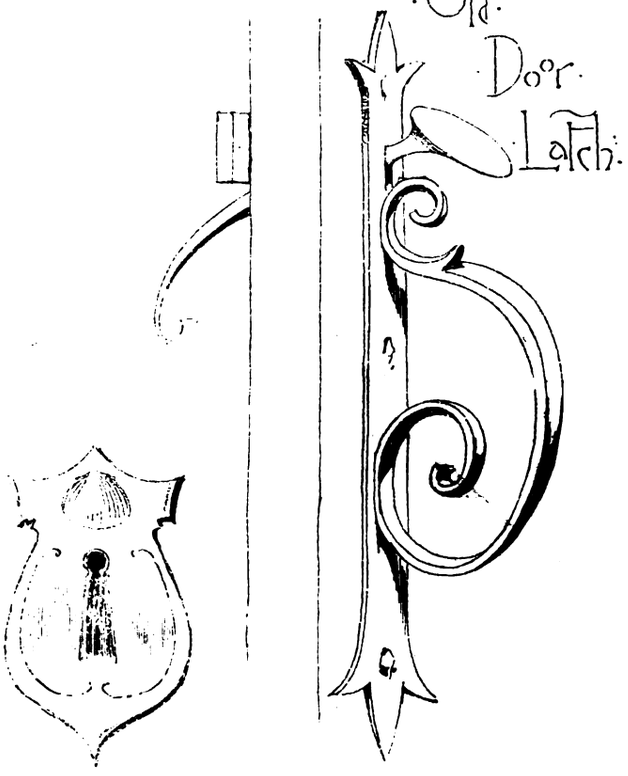


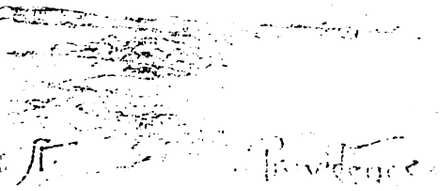
Wrot iron railing on front door steps Providence



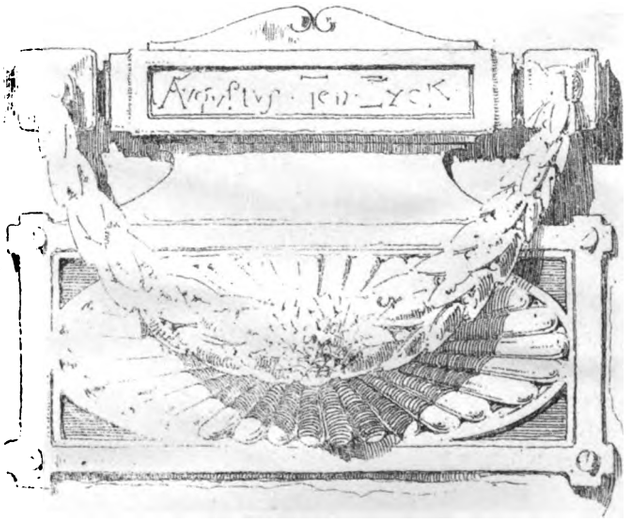
Hanging Lantern



Old Door Latch



Providence



Brass work from Providence & Elsewhere

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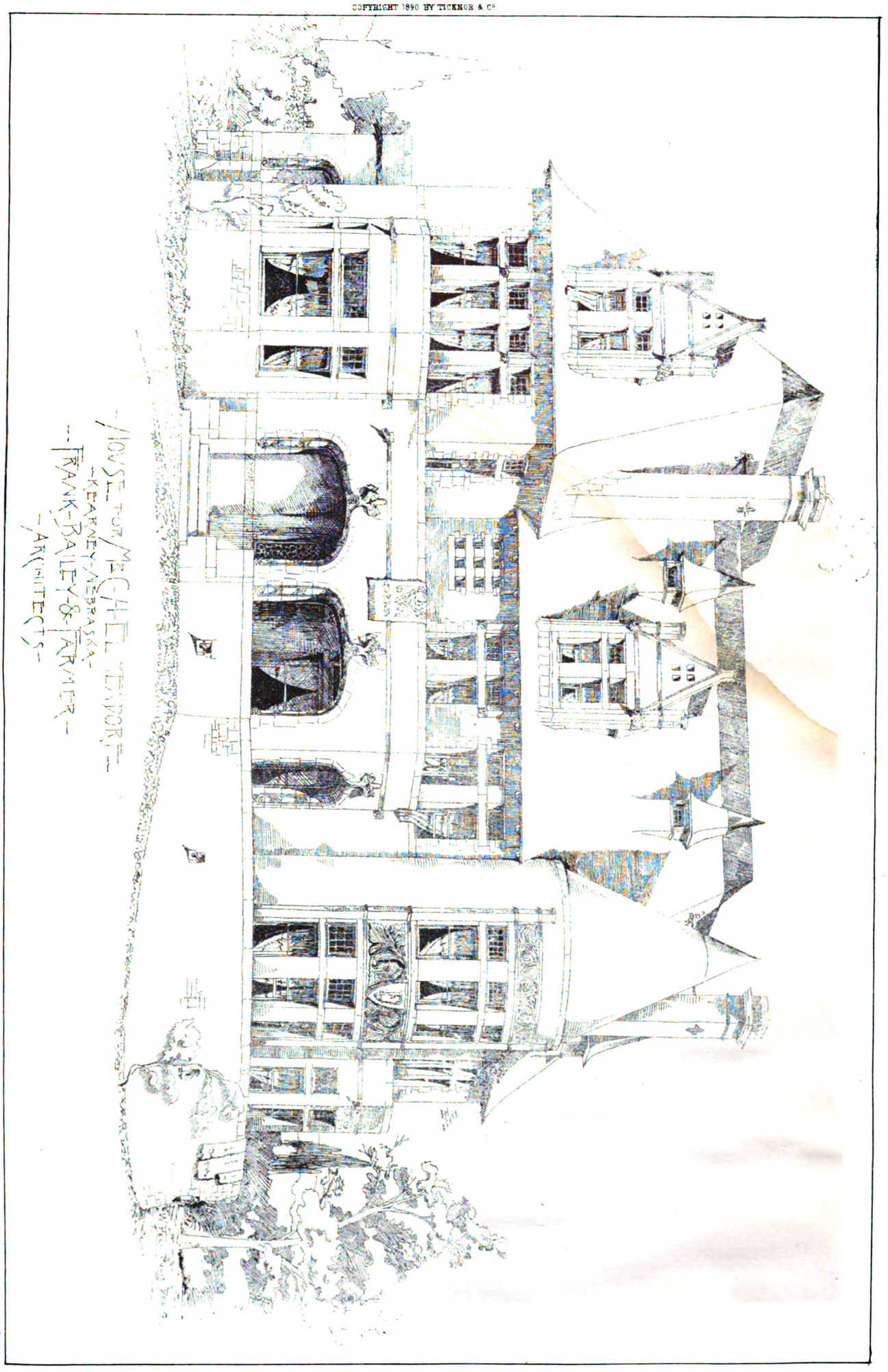

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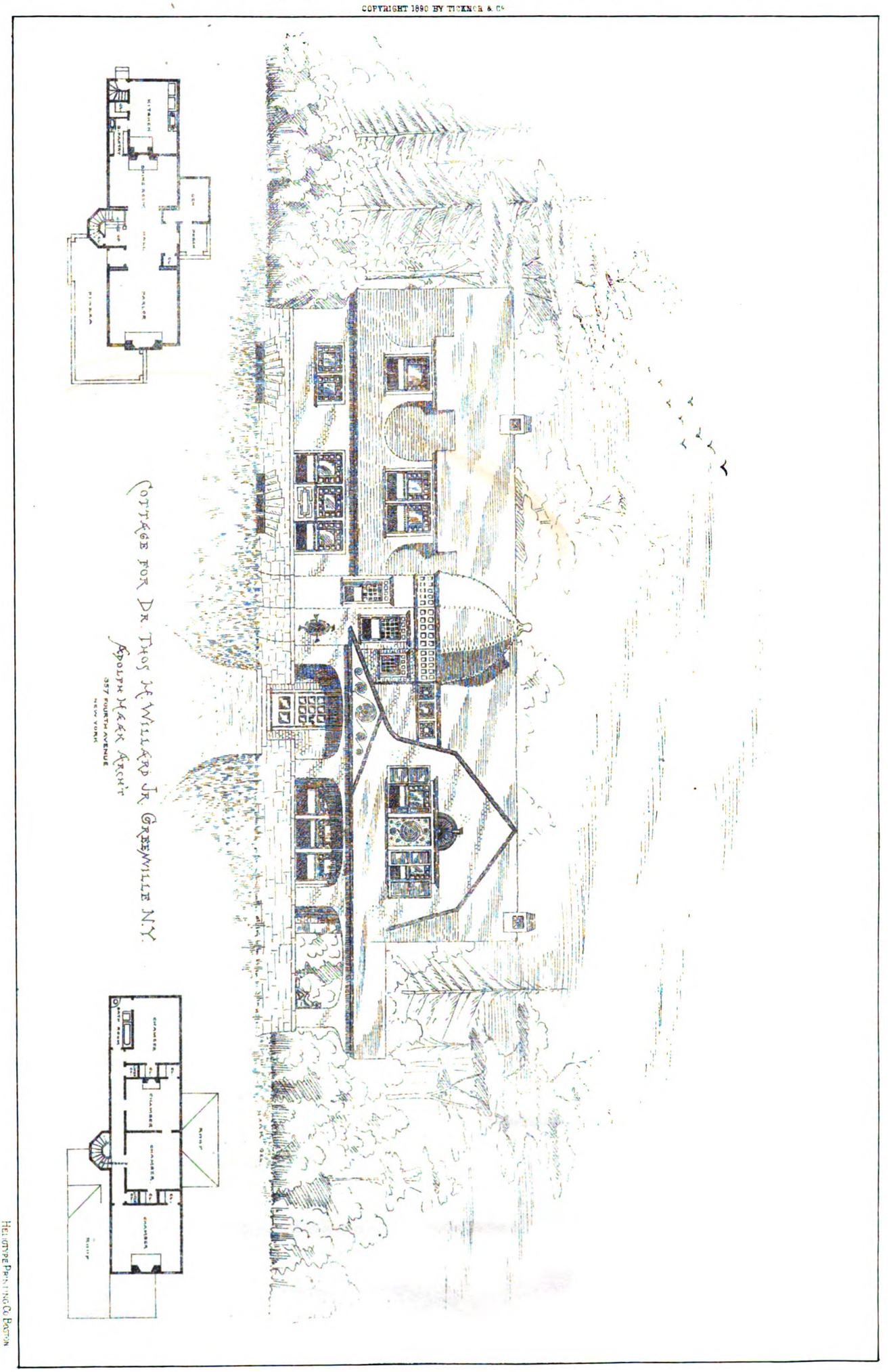

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On Church St.

Over the tree-tops from the River.

STEVENS & COBB, Architects.

New Baptist Church — Gardiner, Maine.

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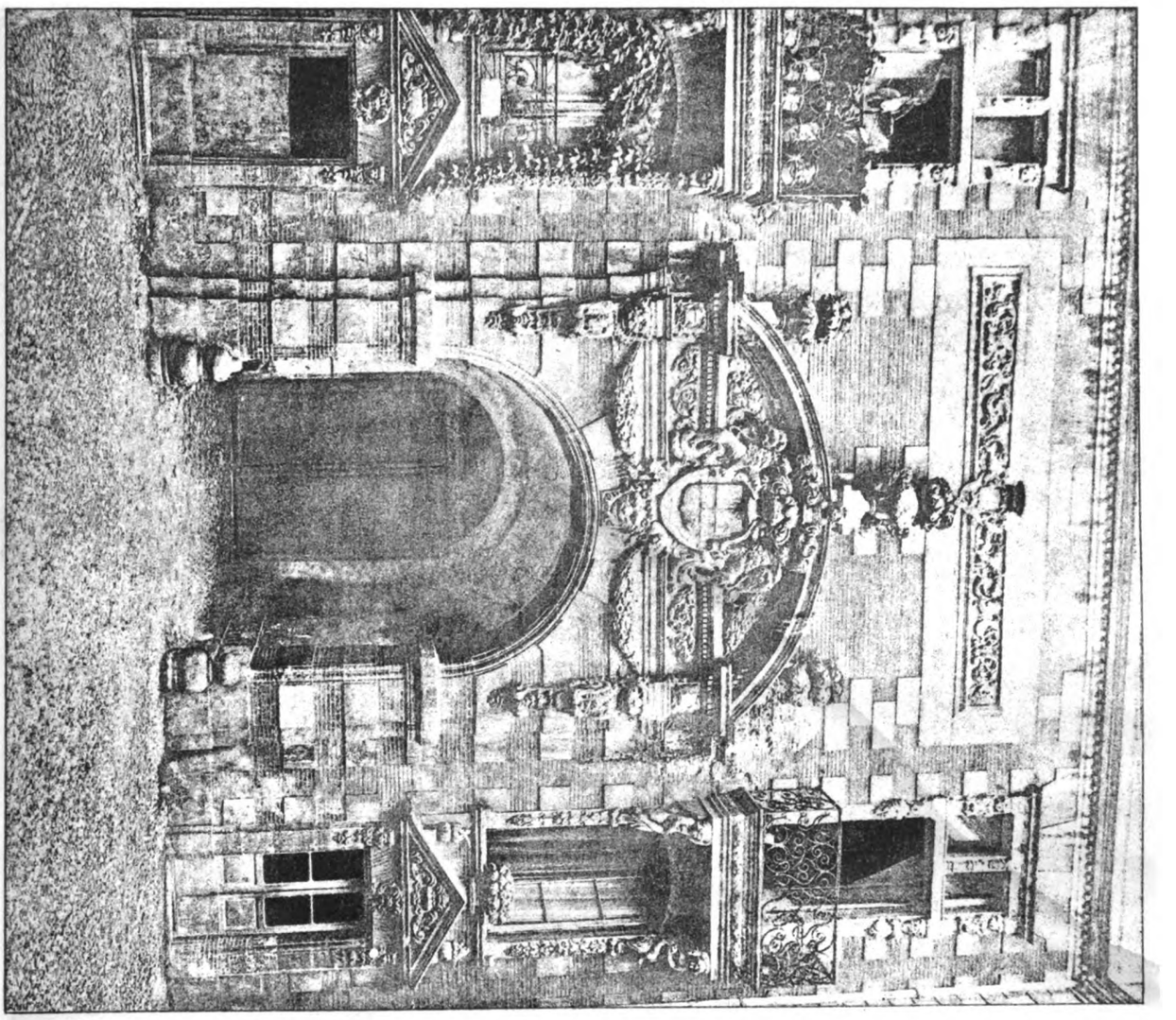

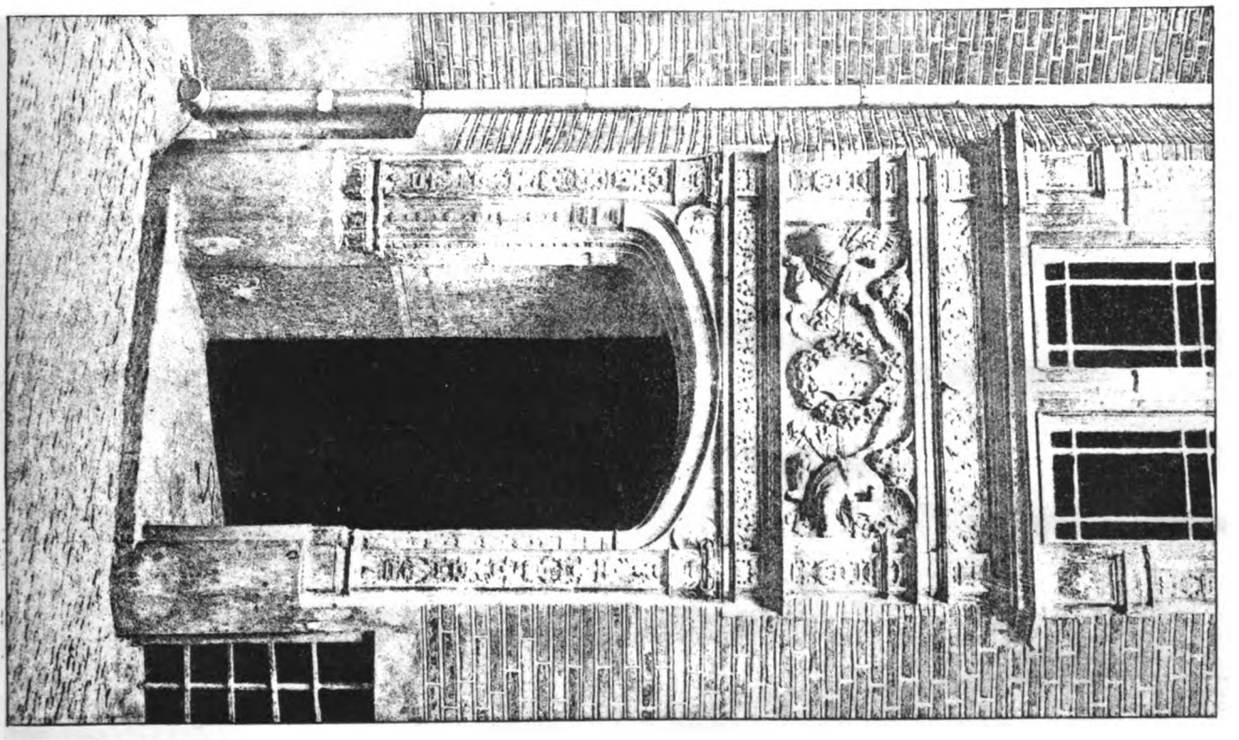

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

VOL. XXVII. Copyright, 1890, by TICKNOR & COMPANY, Boston, Mass. No. 738

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FEBRUARY 15, 1890.

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WE have been favored with the privilege of reading a pamphlet, reprinted from one of the numerous reviews which have recently come into existence, and containing the thoughts of some person, apparently of advanced age and discursive disposition, on the subject of "Fires in American Cities." As usual in such cases, the author administers a whack to the architects, whose attention he "wishes might be directed" to the fact that about 1788 a house was built, by a person of great intelligence and worth, who "seems to have borne a strong resemblance to Franklin in his enlightened zeal for the application of science to the arts of life," in which "all the floors were laid in mortar," and the boarding of the vertical walls was back-plastered. In this wonderful dwelling, whose superiority to the creations of the degraded and imbecile modern architects is obvious, "fires might be kindled with a generous supply of combustibles," on the floors, or against the walls, but would "smoulder away and expire when the supply was exhausted, without essential injury to the building," and "by no amount of feeding or urging could a fire be made to pass from room to room." It is surprising to think that there could ever have existed another person gifted with insight and genius enough, not only to appreciate the achievements of his predecessor, but even to surpass them, but such a marvel was, it seems, produced some generations later, in the person of our author, who, instead of merely having his house back-plastered, and mortar put under the floors, filled-in the partitions with "cheap bricks laid edgewise." We are assured that this method "hardly admits of essential improvement," and, in fact, the only other construction referred to in the book as "worthy of emphatic notice," is that of the New Jerusalem, the "uninflammable materials" of which, precious stones, jasper, gold, pearl and the like, are so fortunate as to meet with our author's approval.

ASIDE from these admirable suggestions as to either back-plastering houses and filling them in with cheap brick, or using gold and jasper and pearl exclusively for building materials, we do not find in the pamphlet before us all that wealth of information and admonition suited to the needs of architects, for which our author's description of his own eminent merits had prepared us. We are told, indeed, that it is "desirable" to use iron for "floor-beams and pillars wherever required," a remark so clear and convincing that even the bestial intellect of an architect can perceive its force; and we learn that fire-proof buildings cost only about fifteen or twenty-five per cent more than combustible ones, and that, "on a wise calculation," it "would take but a few years to cancel this extra cost by saving in the single item of insurance." As architects have a great deal of this sort of ciphering to do, it would be interesting to know how to make the "wise calculations" by which the principal and interest, besides taxes, of an addition of twenty-five per cent to the cost of a building are to be extinguished "in a few years" by a saving of about one-half of one per cent per annum on the whole value of the building in insurance; but mathematics of this sort, as we often have occasion to point out, are matters of inspiration, or rather, of a sort of revelation, the sources of which are closed to the sordid minds of ignorant architects. In the present case, however, another gleam of supernal light has illuminated our author's soul in regard to insurance agents, and we would like to call the attention of these gentlemen to the opportunity thus offered them to bask in its edifying rays. "Nay," we are told, "it is doubtful whether there exists an owner of uninsured property who has not repeatedly encountered the importunate solicitations of insurance agents." Indeed, there is something "weird" in "the clairvoyance by which these agents know when one's policy is about expiring," etc. Now, we need not say that to indulge in anything weird about one's business is almost as bad as to solicit owners of uninsured property to take out policies; and it is not surprising that our author finds it "perfectly evident that fires cannot diminish in frequency so long as this system remains unchecked"; and considers that "the first movement of reform should be directed toward the agencies." The reform which he proposes is that insurance agents should no longer be paid by commissions on the business they secure for their companies, but should have "a stated compensation," to be increased, if at all, only on the ground of the prudence, integrity and fidelity with which the business is conducted. Prudence, in the case of agents, is to be shown by the rejection of doubtful risks, and by efforts "to make the insured person, as he really is, the obliged party of the two." To guard against the press of customers which would overwhelm the more "prudent" insurance agents under this system, it is further provided that each agent should be restricted to "his share of the safe business in and around his place of residence." We suppose, of course, although the matter is not further mentioned, that any soliciting of business is to be at once stopped, and that, prudence in the refusal of policies being the chief virtue of insurance agents, the man who writes the fewest policies will get the highest salary. This view of the subject had not, we confess, occurred to us before, but the proposed reform seems to be fraught with the promise of peace and leisure to a body of men now much overworked.

A RATHER curious case was decided the other day in Baltimore. It seems that there is an ordinance of that city which provides that no permit for building shall be issued, unless, in the judgment of the Appeal Tax Court, the size, general character and appearance of the building to be erected shall be such that it will not depreciate the value of the surrounding property, whether improved or unimproved. A certain Mr. Hampson applied for a permit to erect six three-story brick dwellings on a certain street, but was refused, on the ground that the intended structures would injure the value of neighboring estates. He brought suit to compel the Appeal Tax Court to issue the permit, and his prayer was granted; the court saying that, while it might be desirable to have magnificent avenues, with handsome residences, constitutional rights could not be interfered with for that purpose; and that the City Council had not the power to pass such an ordinance as that under which the permit was refused.

THE New York *Evening Post*, which takes a singular interest in the new Capitol at Albany, has discovered that at least "seventy-five thousand dollars' worth" of damage is caused every year to that building by the "defective system of gutters

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and water-pipes" used in it. This statement is said to be made on the authority of Commissioner Perry, who, as the resident Superintendent of construction of the building for many years, ought to know something about it. Just what the damage consists in, we do not precisely learn, but we are informed that "visitors," observing "the discoloration of the frescoed walls and ceilings in many parts of the building," "shake their heads dismally at this additional evidence of the decay and ruin that is overtaking the nineteen-million-dollar structure." That it should cost seventy-five thousand dollars a year to restore now and then a little frescoing on the walls and ceilings will not surprise persons familiar with the financial and political history of the building, but it is rather strange that the construction should have been such as to make any leakage possible. According to the same account, the trouble is mainly with the gutters, which "should be properly lined." One might think that seventy-five thousand dollars a year would pay for lining a good many feet of gutter, and, so far as this was done, we are told that "the leakage would be stopped"; but the matter is perhaps waiting until another election shall stir up an ardor for repairs in the New York Legislature, accompanied by an appropriation which will make seventy-five thousand dollars seem an almost microscopic sum.

PROFESSOR TETMAJER, of Zurich, one of the greatest living authorities on such subjects, made recently an investigation into the causes of the decay of stone in buildings, and the best means of preventing it. Many of our readers will remember Viollet-le-Duc's striking observations in regard to the same matter, deduced from an immense experience, and Professor Tetmajer's conclusions agree entirely with his. According to both, the freezing of water in the pores of stone is the principal cause of its disintegration. Even the chemical effect of the air in large cities, due, it is supposed, to the sulphurous acid contained in it, probably acts through the rain-water, by which the acid is washed out of the air, and carried to the stone, so that anything that will prevent the accumulation of water in the pores is likely to diminish chemical action, as well as risk from frost. Contrary to the common idea, the most porous stones are, if properly used, not necessarily most subject to disintegration. If the water falling on the stone has a chance to escape freely, frost will not injure it, but if the movement of the water in the pores is checked, so that it accumulates anywhere, the freezing of this accumulation will gradually destroy even a strong stone. Proofs of this may be found in nearly all buildings faced with sand or limestone. If the base, or water-table, or even a belt at any height, is of harder stone, the freestone just above it will be found to disintegrate after a few years, owing to the checking of the downward movement of the water in the pores. So, on the underside of a projecting moulding, or balcony, where the water accumulates by gravitation, but is prevented by capillary attraction from dropping off, flakes of stone will soon be observed to separate and fall; and soft stone near the ground, where moisture drawn up from the earth by capillary attraction, joined with the double effect of the rain, and the spattering of rain-water from the ground, keep it particularly moist, soon perishes. The decay of stone shows itself in two ways. With a stratified stone, the frost dislodges flakes and plates, by working in the natural seams, but with a massive, homogenous stone, the effect of freezing is to dissever the particles of sand, or the crystals of carbonate of lime, so that, although the stone may for a long time hold together nearly in its original shape, the rubbing of the hand will dislodge a shower of sand, and the profiles and arrises insensibly lose their sharpness.

THE cure for this is, in the first place, to treat the stone with skill. A soft stone, if laid above a hard course, should be protected from the rain, so that no water will descend through its pores, to be checked by the hard layer; the lower courses of buildings should be of as hard and impervious material as possible, and vertical joints should be packed hard with cement, and jointed, as imperfect joints collect much water, which soaks afterward into the stones on each side; and all projecting courses should have a drip, which will collect the water in the stone, and enable it to drop off. In cases where nothing better can be done, the old process of Faure & Kessler, now of Clermont-Ferrand, in France, by which the stone is impregnated with fluosilicates of various substances, according to the character of the stone to be treated, is the only one which has proved itself successful. Something might be done, perhaps, with limewater, and it is curious that, where a base-moulding has begun to decay, the portions under the vertical joints of the course of stone immediately above, from which small quantities of dissolved lime have probably washed down on the moulding beneath, are preserved, while the intermediate portions are disintegrated; but this application has not been studied to a successful result. In the case of stone not built into a wall, it is often found that while damp with quarry-sap, or soaked with rain-water, a sudden frost will split the blocks into fragments, and this must be provided against by keeping the stone dry; but Professor Tetmajer and his assistants report that they have never known a stone to burst with frost after it was built into a wall.

THE city administration of Paris has been inspired with a new idea. It is now some years since the street corners were furnished with a map of the neighboring streets, at a large scale, enamelled on a porcelain tablet, and affixed to one of the corner houses; but this device is far surpassed by the new one, which has just had a preliminary trial at the corner of the Boulevard Magenta and the Rue Lafayette. Here is to be seen a bronze statue of a child, standing on the curbstone, and holding up a large lantern. The lantern has a gas-jet inside, for illumination at night, and the glass sides are covered with inscriptions. A part of these inscriptions is contained in two columns, the first of which presents the names and addresses of the deputies, municipal counsellors, mayor and assistant, commissary of police, and justice of the peace, the official physician and midwife, and the dispensary for the district, together with the office hours of the functionaries in question. Following these, in the same column, are the addresses of the nearest physicians, druggists, midwives, dentists, veterinarians, express and railway ticket-offices, telegraph offices, mailing boxes and branch post-offices, police stations, fire-engine houses, hydrants, fire-alarm boxes, employment offices, omnibus and horse-car stations, cab-stands, pawnbrokers' shops, tramps' lodging-houses, hospitals, ambulance stations and *châlets de nécessité;* the whole accompanied by a map of the Boulevard Magenta and the neighboring streets. The second column contains an historical notice of the Boulevard Magenta, and a list of all the houses and tenements to let in the district, with the number of rooms, the price, and the date when possession will be given. The remaining space on the lantern is occupied by a complete list of all the inhabitants of the district. The intention is to subdivide the city into districts in this way, each district to have its lamp-post directory.

THE *Bautechnische Zeitschrift* makes some observations in regard to the method of sinking wells by means of a ring, which may be useful. The ring which it proposes is composed of brick and wood. A ring of oak, well put together, is first laid on the ground. This has twelve holes in it, through which are put twelve bolts, four feet long, projecting upward A circular wall of hard brick in cement is then built on the oak ring, about three and one-half feet high, and a second oak ring, with holes bored for the bolts, is laid on top, washers and nuts put on, and the whole screwed firmly together. The excavation is then started in the middle, in such a way as always to leave as nearly as possible the same breadth of foundation under all portions of the ring, although this width diminishes constantly. By taking this precaution, the undermining, and consequent settlement of the ring, proceeds uniformly and vertically, while, if the excavation should be carelessly made deeper on one side than another, the settlement is likely to take place suddenly, and obliquely, endangering the life of the workmen in the well. For all this, as it says, it is impossible, without close watching, to make laborers work in the manner on which their own safety depends. Either from the incapacity for thinking about anything, or from the stupid satisfaction in doing what they are told not to, both of which are characteristic of a good many laborers, the men are almost sure to dig at one side until settlement begins, before doing anything on the other side; and the writer of the article mentions a case where he found that the workman had dug out, close to the ring, thirty inches deep, around two-thirds of the circumference, before touching the remaining portion, thus endangering his own life without the slightest reason or excuse.

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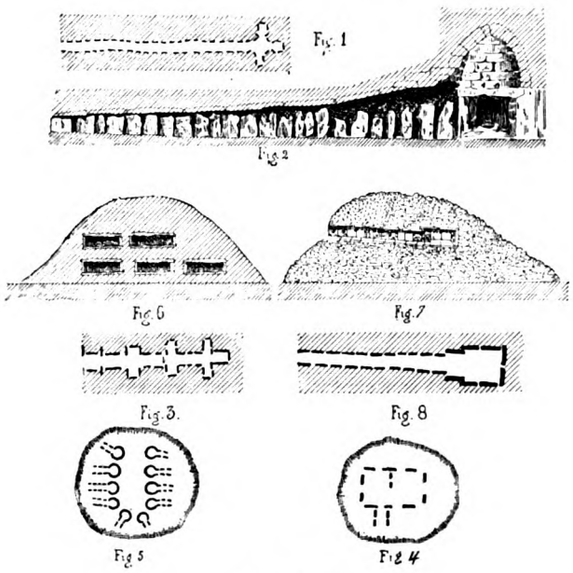
FUNERARY ARCHITECTURE.[1] — I.



Celtic Tumuli.

THE custom of honoring the memory of the dead by monuments erected over their remains certainly dates back to remotest antiquity and far beyond the limits set to history. Without going into the philosophical discussions naturally enough suggested by this custom, we must consider the fact that it is intimately connected with the more or less well-defined belief which incontrovertibly prevailed among most primitive peoples, that death was only a transformation of life.

The variations introduced into this belief by the different primeval religions had their influence, of course, on the disposition and, consequently, on the architectonic forms of the tombs; but this influence generally left intact, or, at least, recognizable for centuries the two or three primordial types of sepulchres. Whether the body were deposited in a cavern hollowed in the mountain side, whether an artificial mound of earth or stones, or a monument consisting of one upright stone, or a gigantic pyramid were raised over it, the tomb of ancient times always invariably belonged to one of these types. In spite of those modifications in structure and form suggested by the individual genius of different peoples, it was almost uniformly a derivative of the *tumulus* or the *stela* [upright stone]; for change on this planet of ours comes very gradually, and only by a series of almost imperceptible transitions.

There are, indeed, exceptions to the rule, but these are fewer than would at first appear; and it was only after tombs ceased to be isolated monuments, and were placed in religious edifices — that is to say, after the first centuries of the Christian era — that their original characteristics disappeared. Different constructions were then introduced by the new religion, which was so unlike its predecessors.

Every people has, we believe, left some specimen of funerary architecture; the subject is, therefore, too vast for us to hope to treat it exhaustively in this article, and we may be pardoned for designedly omitting a large number of types of tombs, doubtless interesting from an archæological point-of-view, but only remotely relating to architecture properly so-called, or belonging to civilizations as yet but little studied.

We will content ourselves with describing in broad lines the different funerary monuments, beginning with the most ancient, though without keeping to a strict chronological classification: in the present state of archæological knowledge, such classification would often be difficult to establish conclusively. Since, as we stated above, the various tombs among ancient peoples were generally after the order of a *stela* or a *tumulus*, it seems best to begin with the most rudimentary examples of these two types, if not the first chronologically. The Celtic monuments, with which the soil of France is still strewn, will furnish the materials for this study.

It must be admitted that the rough stones planted vertically in the ground, and named by antiquaries *menhirs or peulvans*, were not always tombs; they were sometimes commemorative monuments, and sometimes even mere boundary-stones. When, however, as has often happened, bones are found interred beneath them, they are beyond a doubt burial-stones, and it seems to us difficult not to recognize in these monuments the indisputable archetype of the *stela*. A considerable number of them are still to be seen, in an upright position, not only in France, but in England, Scotland, Ireland, Germany, Denmark, Sweden, Greece, Tartary, and even in America and Africa. They are of varying dimensions, being sometimes forty or fifty feet high. They are in their natural shape and the rude carvings sometimes seen upon them belong to a later period. It is not to be inferred, because similar stones exist all over the globe, that the Celtic form of worship was of world-wide adoption; it is a much more probable supposition that this primitive way of rearing a monument was the one which was, by the very nature of things, forced upon all aboriginal peoples, whatever their religious dogmas might have been.

As for the *tumulus*, which we find in use among all peoples, and of which the pyramids and the great Roman tombs are only the artistic *avatars*, what could have been its origin? Was it the artificial mound designed to recall the mountain in whose side primitive man was born, lived and died? Was it the heap of stones piled up at a certain spot, as an act of worship, by pious passers-by? We will not attempt to solve the question, both hypotheses appearing equally plausible.

The Celtic *tumuli* present a considerable number of varieties; some are spherical or ovoid, others are conical or bell-shaped; sometimes they are found in couples. Some are merely of earth, with or without circles of upright stones. Others contain one or several burial-chambers, the walls and ceilings of which are made of slabs of unhewn stones; for example, the *tumuli* of New Grange (Celtic Tumuli, Figs. 1, 2); Yellow (Fig. 3); Bougon (Figure 4); and of Fontenay-le-Marmion (Figure 5). More rarely they show several superposed coffins (*tumulus* in the Orkneys, Figure 6). Sometimes, instead of a rectangular burial-chamber, we find one formed of two large, flat stones inclined like a roof over the body. Lastly, when the *tumuli* are heaps of stones, antiquaries give them the name of *galgals* (Galgal of Gavrenez, Figures 7, 8). The dimensions of the Celtic *tumuli* vary greatly: there are some with a base-diameter of over 325 feet and an altitude of fully 100 feet. According to a custom which has been perpetuated among peoples of a more advanced civilization, the dead were buried with their weapons and other articles which they used in life. It is to this custom that modern archæology is indebted for much of its knowledge.

A vast number of the celebrated tombs of antiquity were nothing more than *tumuli*. We will merely mention those of King Alyattes, father of Crœsus, of Ninus, of Patrocles, of Achilles and of Tisias in Phocis. The works of ancient authors abound in conclusive evidence on this subject. In fact, this sort of grave monument has never gone wholly out of use, and we find examples of it to-day among savage tribes.

But let us turn to the history of funerary architecture among peoples where the worship of the dead manifested itself in productions that were genuinely architectonic, and, consequently, much more interesting to us.

THE EGYPTIANS.

Of all sepulchral monuments, those erected by the Egyptians are unquestionably the most important, on account of their great size; they are also the most curiously arranged, and the most remarkably adapted to the preservation of the body for an almost indefinite period. The works of modern Egyptologists, like Mariette and Maspéro, have recently thrown much new light on these monuments, which have been so long known and so often described. Their learned investigations, which fresh excavations and discoveries are daily rendering more valuable, have cleared up many mysterious points and explained many strange peculiarities.

A few words on the beliefs of the Egyptians are indispensable here. According to their views, the second life was much like the first, and it was assured to the dead only through the preservation of the body, which was necessary to the support of this new life. Hence the extraordinary study and care given to the perfecting and exercising of the art of embalming; hence the endless precautions taken to hide the entrance to tomb and to guard it from subsequent violation; hence the unfailing observation of the rule to bury the body above the level of the highest floods of the Nile; hence, lastly, the pains taken to conceal near the tomb images of the occupant which,

[1] From the French of Pierre Benouville in Planat's "*Encyclopédedie l' Architecture et de la Construction.*"

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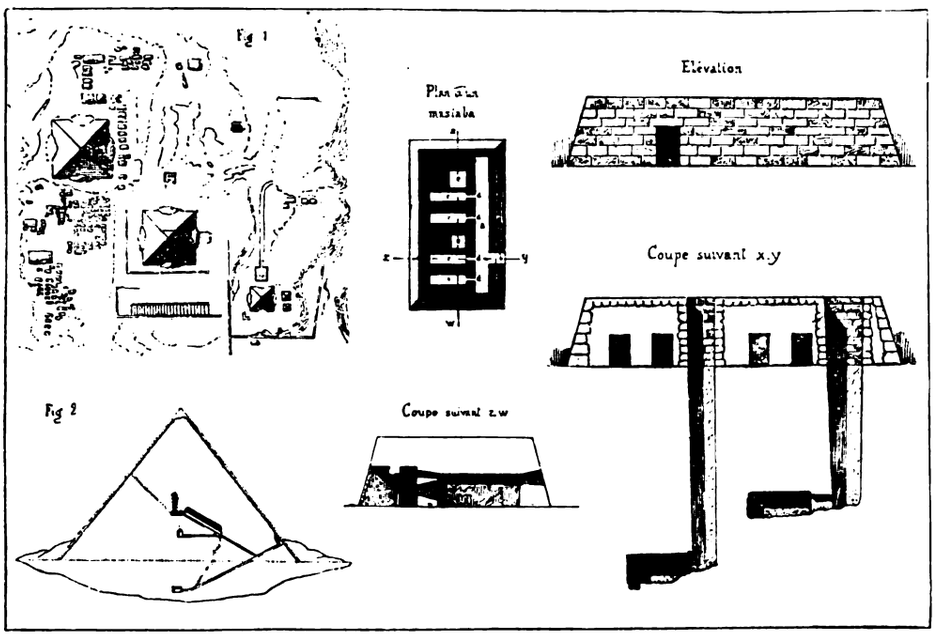
it was thought, might replace his body and assure him continued existence. As the dead man carried with him to the grave his earthly needs and tastes, all articles requisite for their gratification were deposited near him; his servants were represented in bas-reliefs or by statuettes, and provisions either real or artificial were supplied. The funeral repasts and libations, the endowments for the care of tombs and for the perpetuation of ceremonies which to their minds were a sort of material necessity to the dead were, therefore, only the logical result of the beliefs of the Egyptians.

Admitting the importance which the execution of these rites possessed for the dead, it is clear that filial gratitude or the respect of man for his ancestors must have raised the worship of the dead to the height of a veritable religion. Among no people was this worship more deeply rooted than among the Egyptians, and consequently their funerary architecture is the noblest manifestation of their art, especially is this true of the burial monuments of the time of the First Empire.



Egyptian Tombs.

The most ancient Egyptian tombs are those which Egyptologists have for several years designated under the name of *mastaba*, a word borrowed from the Arabs employed on the excavations. This kind of tomb belongs to the First Memphite Empire, and it is in the necropolis of Memphis that the largest number of them are to be seen. Whether found in that part of the necropolis named Sakkara or at Gizeh near the great pyramids, they differ but little from one another. They are, of course, in ruins; however, it has been possible to restore the chief sections from what remains of them. It is this restoration which we give below, following the descriptions furnished by Mariette.

The Pyramids.

The *mastaba* is a massive quadrangular structure, a genuine tumulus. The outer walls batter quite decidedly, though not sufficiently to warrant the conclusion that the tomb is an unfinished pyramid. The larger axis of the rectangle follows very nearly the direction of the magnetic needle; at Gizeh, for example, where the *mastabas* are symmetrically placed, the necropolis presents the appearance of a vast checker-board (Egyptian tombs, Figure 1); at Sakkara they are scattered haphazard, but are, nevertheless, set due north and south. A wide difference is noticeable in the character of their construction; some are of brick, others of stone, the latter being of medium size; within, the foundations are generally roughly built. The exterior faces show either receding courses of steps, or smooth surfaces. Their dimensions sometimes reach 160 feet x 80 feet; they are rarely less than 26 feet x 20 feet, and the height varies from about 13 to 25 or 30 feet. The upper platform is level; earthen vases sunk in the débris of the masonry forming the ceiling of the burial chambers once held the water destined to slake the thirst of the occupants. The entrance is almost always found on the eastern face of the tomb; the door opens in a rectangular niche near the north-east angle. The interior of the *mastaba*, whatever the minor variations, always comprises one or several chambers or chapels, the *serdab*, the well or shaft, and the burial-chamber proper.

The chapels are lighted by the door, and sometimes by openings managed in the ceilings; their walls are often decorated with a profusion of sculptures or paintings representing the occupations of the dead in their new existence; fronting the east rises the stela, at the foot of which the table for offerings is usually found. The chapel is the only accessible part of the tomb.

The *serdab* (*c*, Plan of a *Mastaba*) is a sort of corridor buried in the masonry, and often has no communication with the chapel; in certain cases a connection is established through a narrow conduit designed to carry to the dead the odor of the sacrifices offered in his honor. The *serdab* always contained one or more of those statuettes of the deceased which, as we have said, were indispensable to the support of his posthumous life, in case the body became totally annihilated.

The well or shaft generally starts from the upper platform, and, traversing the entire *mastaba*, enters the ground or rock to a distance of even 80 feet: it gives access to the burial chamber, which is without decorations and contains the

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sarcophagus. The latter, which is of limestone, red granite or black basalt, is more or less ornamented; the receptacle is rectangular in shape. The precautions taken to close the receptacle hermetically were in inverse ratio to the degree of perfection attained in the embalming process at the period when the tomb was built. The entrance to the walled burial-chamber, that is the shaft, was filled up with stones, earth and sand.

The illustrations, taken from the work of Lepsius, complete this outline of the prevailing type of the private Egyptian tombs of the First Empire. The essential features here described are always found (except in the case of the *serdab*, which the perfecting of the embalming process seems to have rendered dispensable); this is true not only of the *mastaba* but also of its royal contemporaries, the pyramids. Every possible use has been assigned to these gigantic monuments; the hypothesis on which the various theories have been framed have proved equally baseless; notwithstanding the mystery that still envelops certain of their dispositions, no scientific investigator now doubts that they served as tombs.

Near the pyramids, ruins of ancient funeral temples have been discovered, which were designed to take the place of the chapel of the *mastaba*; did these temples, to which officiating priests were attached, contain *serdabs?* Their ruined condition makes it impossible to affirm this absolutely. As for the pyramid itself, it requires but a glance at the accompanying section of one (Egyptian tombs, Figure 2) to discover, in spite of their modifications, the shaft and the burial-chamber. The interior arrangements of the large number of pyramids that have been studied are greatly varied, but the same principles are always observed. Their dimensions, which are sometimes gigantic, differ widely; this is accounted for by the fact that every king, like private individuals as well, began his own tomb, and kept on enlarging it until his death, his heirs contenting themselves with completing the monument without adding to its dimensions. Starting with this peculiarity as a basis, several *savants* have developed an entire constructional system for the pyramids, which supposes them to have been built of successive courses constructed about a core. Their system, at least in certain of their deductions, cannot be unreservedly accepted; subsidences would have been inevitable in a mass thus put together; and the relatively high position in the monument of the burial-chamber and the conduits leading to it could not be explained. The discoveries already made on the subject are far from conclusive, if not for all the pyramids, at least for the greater part of them.

The outer sides of the steps or courses, which are to-day bare, were originally covered with a stone dressing having a smooth polished surface. Some authors think that it was formed of hard stones or marbles of different colors: this hyphothesis seems plausible in view of the marked fondness of the Egyptians for polychromy. In addition to the temples mentioned above, the pyramids were often accompanied by enclosures entered through pylons.

In closing the description of these gigantic sepulchral monuments, the aspect of which, mutilated though they be, leaves an ineffaceable impression on the beholder, we give a brief sketch of the largest and most celebrated, the pyramid of Cheops.

Its base measures[1] 475.73 feet; its altitude is 450.47 (479, originally). From the entrance, which is carefully concealed under the facing about 50 feet above the base, a corridor, showing a section 5.97 feet square, slopes down to the central mass at an angle of about 26 degrees.

About 130 feet from the entrance, the passage is shut off by a huge block of stone, which was precipitated into it after the accomplishment of the solemn burial task. This block, which could never be displaced, was passed by forcing a way through the adjoining masonry. While the monument was in process of construction it had been lodged in a spot expressly prepared for it, and supported on stays which were knocked out when the tomb was to be closed. In nearly all the pyramids, specimens of this ingenious arrangement are found, showing the extreme precaution exercised to guard against the depredations of spoilers.

Beyond this first and serious obstruction the passage bifurcates. One branch descends at the same inclination to an unfinished underground chamber; according to Herodotus, it could be flooded by the Nile. The other branch takes an upward direction to the entrance of a second passageway, which runs horizontally and leads to the room called the "Queen's Chamber," situated at the centre of the monument, and measuring 19.7 feet x 17 feet.

From the horizontal corridor a passage, sometimes vertical and sometimes slanting, opens into the lower chamber. Returning to the entrance of the horizontal passage, we find a large ascending corridor, 6.86 feet broad and 65.6 feet high; a series of corbels reduces the width of the ceiling to 4.82 feet. This last passage gives access to a sort of anteroom, preceding the burial-chamber; both these rooms were originally closed with granite slabs fitting into grooves. The latter, measuring 34.76 feet x 16.86 x 20.04, contains the sarcophagus, which, like the chamber itself, is destitute of all ornamentation. Above the royal hall are several hollow spaces, one over the other, designed solely to relieve the weight on the ceiling, which is constructed, like the walls, of huge pieces of granite handsomely polished and matched. Two narrow ventilating ducts complete the list of open spaces thus far discovered.

(To be continued.)

SPIRES, TOWERS AND DOMES.[2] — II.

Carpeaux's "Dance." Grand Opera-house, Paris.

THE principles which are shown by modern science to underlie architectural construction are in themselves few and simple, and at the same time reliable. A firm grasp of them may be obtained in the first year or so of study. The mathematical knowledge wrapped up in them is not extensive, and should flow without effort from the mind fresh from college or school. Such knowledge, once allowed to rust, never regains its old vigor. The mathematical and scientific attainments obtained in college life must be carefully nurtured and trained, or they will wither and die under the fierce glow of æstheticism — a sentiment early permeating the whole being of the earnest student. The few principles which govern tower-building may be enumerated very shortly. After having settled the general plan, outside dimensions and approximate height, the thickness of walls should be tentatively settled, being dependent upon subsequent calculations. Such preliminary judgment should be based upon the least thickness of masonry that is requisite for keeping out weather, consistent with forming a secure and complete bond in the material, and other practical considerations, as window treatment, provision of sufficient abutment for vault springings and corbelling. The approximate weight of the structure may then be calculated, and attention is then paid to the influences which are likely to endanger the stability of the tower when properly constructed.

Towers and spires, above all other buildings, are exposed to the full fury of gales. The force of wind obviously varies directly as the rate at which it is going along, and is given by the following simple formula: $P = \frac{V^2}{100}$ where P is the pressure upon the square foot in pounds, and V the velocity in miles of the wind in one hour. The full wind-pressure that has been experienced must be allowed for, as tending to produce overturning effect. A careful estimate of what the maximum force of the wind is likely to be in the particular situation must be made. This calculation should never be omitted when designing a spire, for the reason that there is no more powerful agent of tower destruction than that which produces the rocking action of a superincumbent steeple.

The effect of wind-pressure upon a tapering Gothic spire is considerably modified by the plan, elevation, and mode of construction of the spire. The inclination of the sides of Gothic spires, varying, as they do, from about one in five to one in ten, reduces the estimated horizontal wind-pressure by two pounds and a one-half-pound respectively on the square foot. This is so small an amount as to be

[1] Our author should give his authority for measurements so at variance with those given by the accepted authorities. — EDS.

Napoleon's Survey in	1799	gives the length of side as					763.62	feet.
Col. Howard Vyse	" 1837	"	"	"	"	"	" 764.	"
Aiton & Inglis	" 1865	"	"	"	"	"	" 759.163	"
Royal Engineers	" 1869	"	"	"	"	"	" 760.83	"
Piazzi Smyth		"	"	"	"	"	" 761.66	"

[2] A paper read by Mr. Sydney Beale before the Architectural Association January 3. Continued from No. 737, page 93.

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negligible. For an architect's purpose, it is unnecessary to find what the reduction is for the vertical slope of a particular spire, as the error is on the side of safety. The plan, if polygonal, necessarily reduces the maximum wind-pressure from what it would be if acting upon a rectangular-planned spire — a reduction ranging usually from one-third to one-half for plainly-constructed spires.

Further, if the spire is built with rounded or other rolls projecting up the ribs at the line of intersection of the planes of the spire, not only is there more surface exposed to the wind, but the edges of discharge for the wind are cut off, and its impacting force aggravated. From experiments of wind-pressure on cellular surfaces composed of test-plates with only one instead of the usual four edges of discharge, the practice is based of adding one-fourth of the registered pressure on the square foot for each of the lines of discharge cut off. This operation has been regarded in the calculations of the tower on the large diagrams of Pisa.

The vertical faces of lucarnes, or other features, would slightly modify the effective wind-pressure upon a spire, and they must be regarded or neglected according to the degree of nicety aimed at.

Having at last obtained a careful estimate of wind-effect, the approximate weight of the spire with a tentative thickness of material is then estimated, and the subsequent investigation may be either done by calculation of the moments or by graphic resolution. If the investigation be by taking moments, the point about which the forces are estimated as acting should be one-fourth or one-sixth of the least diameter of the spire from the leeward edge, according to its plan. The calculation by moments is advantageous from its allowing any modification of the weight of the spire that may be necessary to balance the respective moments in foot-tons or foot-pounds of the wind-pressure and the spire weight. By this means a reliable spire will be produced, possessing the minimum amount of material required for absolute safety and rigidity. Of all the features of spires that do not contribute to their stability, the entasized outline is the most prominent. Its introduction to correct a visual delusion surely subverts the important artistic office of the Gothic spire. Who will say that the spire of St. Vincent's, Caythorpe, or St. Helen's, Broughton, Lincolnshire, and many other highly-entasized spires, are not artistic failures? For stability, the entasis thickens out the spire at the wrong place; by its adoption the base is cut off at the point where, if anything, it should be widened out.

On the other hand, such features as broaches, pinnacles, miniature buttresses and turrets add weight and consequent stability to the spire when clustered around its base. To make the investigation complete, the further points that should be inquired into are the tendency of portions of the spire to slide on the bed-joints. This action cannot possibly occur if the total wind-force is less than the normal component of the weight of the spire above any bed-joint, multiplied by the coëfficient of friction of the material used in the construction. Failure by crushing should be looked into. The amount of the pressure on the square foot will, in the majority of spires, be greatest at the base, and will vary in disposition and amount according to the distance of the centre of pressure of all the forces acting in and on the spire from the outside edge of the spire. The amount of this pressure upon a unit of area must, of course, be some fraction of the ultimate crushing-strength of the material. If the actual pressure is too near the ultimate strength, the thickness of the material of the spire will be modified. From constructional failures may generally be learned useful lessons for future work.

The failure of the spire of St. Aldate's, Oxford, is a notable instance. The spire, built of stone 50 feet high, stood upon a tower 56 feet high; the spire had become considerably out of the perpendicular and dangerous. It was taken down to the level of the tower.

The cause of failure was attributed to the presence of a 1½-inch iron bar inserted in the first or base-course of the spire. The rusting of the bar had burst the masonry away, inside and out, and it is averred that the pinnacles at the angles only saved this spire from actually falling.

This is but another instance of misapplied material; the spire was 7 inches thick at the base, while to a depth of 10 feet down from top it was of solid stone. If these conditions had been reversed the original spire might now be standing.

This habit of self-extinction has been very eccentric in its operations. It has deprived the art-loving world of many beautiful examples of English and Continental spires.

The calculation for a tower runs upon the same lines as those for the spire, the modifications being due to the different plan and elevational shape and the consequent modification of wind-effect. The tower must answer the same demands for stability against overturning, safety against sliding on any bed-joint, and possess a factor-of-safety against crushing; lastly, the total weight brought by the structure upon a unit area of the subsoil should be estimated, and be within the limit of safety. An interesting inquiry into the tower-construction of Coutances appeared in one of the professional journals some while ago. The result arrived at showed an excess of material in those towers to the extent of 1,000 tons beyond the needs of the case.

Upon the screen is exhibited a chronicle of some of the constructional failures in tower and spire designs in the limited area of England. France, Germany, Spain, Italy, must have an extraordinary record in this same respect. By far the larger number of these towers owe their failure to the causes previously enumerated. Too much importance cannot be attached to the failure of the towers of the ecclesiastical buildings scheduled here, for the reason that the architecture of a country, if it is considered at all, is measured by the standard of its ecclesiastical buildings.

If a factory collapses under the effect of wind-pressure, and the lives of an appreciable number of persons come to a painful end, the sad occurrence soon passes out of the minds of all but those most nearly related to the sufferers; but when a cathedral spire or tower passes out of existence the world chronicles the fact for all time.

Who will deny that each and every one of those towers would be now existing as they originally existed if they had been proportioned according to the laws of stability as we know them? Ely Cathedral and Winchester, Peterborough and St. David's, with their massive construction, paid the penalty. It is difficult to understand the reason for such massive design as is found in them. The size of a structure can be emphasized without unduly thickening of walls. If for richness of effect, it is a mistake. The luxury of material in the case of a tower can neither be seen advantageously from within nor beheld from without. A window-opening may attempt to show the wealth of masonry while vainly endeavoring to let the light through it; but that is poor satisfaction. The insertion of masonry in spires or towers of a thickness beyond what is absolutely necessary to meet the conditions previously laid down can only be considered as a useless and dangerous practice.

A very forcible example of an ill-conceived tower is the leaning one of Pisa. The diagram is enlarged from a measured drawing, and is to a scale of 4.25 feet to the inch.

Preliminary. — The tower, circular upon plan, is nearly 178 feet high, with an out-to-out base diameter of 50 feet, the height bearing a ratio to diameter of 3½ to 1. The walls of the lower story are 13½ feet thick and of the upper 9 feet. The tower is entirely of marble. The calculations explain themselves. The first item is the super-area of the foundations. Then comes the cubic contents of the portion of the tower resisting overturn of the wind; that is, of the exposed part from top to ground-line. The weight of the marble is assessed at 170 pounds the cube foot, and is expressed in decimals of a ton; the total weight of the portion resisting the overturn movement of wind is 15,325 tons, and its moment about point A is 91,950 feet-tons.

Point A is $\frac{D}{4}$ from leeward edge.

The peculiar case of this tower exhibits graphically the application of the previous remarks of the effect of wind upon cellular surfaces.

The reduction of the wind-effect registered upon a flat surface, due to the circular plan of this tower, is annihilated by the galleries in consequence of their forming cells for the reception of the full force of the wind, in consideration of which a 60-pound pressure has been calculated. The moment of this force about the point A is ridiculously below the strength of the tower, the ratio being as 1 is to 5½.

The graphic resolution coincides; the distance of the red line resultant from the centre-of-gravity only deviates two-elevenths of the distance between the centre-of-gravity and the point it would be absolutely safe at, showing that, notwithstanding the severe inclination, there is still a very large margin of safety against the overturn effect.

Next, as to the total weight of the tower upon the earth foundation. The soils in the neighborhood of this tower are not noted for their weight-carrying powers.

The tower brings a pressure of 7¼ tons on the square foot, and, at a fair computation, the soil, a sandy one, is only capable of sustaining 4½ tons.

This fact obviates the need of any further inquiry into the causes of the subsidence. The tower is thrown from 12½ feet to 15 feet out of the perpendicular, has sunk bodily down some feet into the earth, which has since been excavated away from its plinth.

This tower is a unique example of useless masonry overloading its foundations, still standing, as it does, to tell the tale.

It would be safe to say, from the figures that are before us, that many thousand tons of masonry are in the structure which have no business to be there. It can easily be imagined what the fate of the cathedral would have been with the tower of Pisa joined to it.

The investigations of Canon Moseley, Rankine, and other noted American, French and German scientists have now taken a firm hold upon the constructive professions, and these researches are destined to have a far more weighty influence upon architectural construction than has hitherto been the case, tending to produce in our buildings the fullest economy of material consistent with practical needs and lasting stability.

Domes.— Of the numerous domes that have found existence in the last few centuries, how many can be said to be monuments of architectural and constructive skill? The last century has seen great strides made in many branches of science, and yet in the erection of domes, a field in which scientific knowledge could have such full scope, construction is drifting in a backward rather than in a forward direction. The most recent dome (that for the tomb of the late Emperor Wilhelm of Germany) decides that the dual construction still holds the field.

So that, since the days of Wren, there has been seen no legitimate advance in the matter of dome-raising, and it is the opinion of some that his step was to one side of the obstacle rather than over it.

The cathedral cupola of London was the first of a new race, and in

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its essential principles one which has been followed by each successive dome constructed of similar materials.

There is no need to recapitulate here the time-honored theory of the construction upon which have been based the erections of recent centuries. High architectural authorities have satisfied themselves upon the point, and the casual student rests content. It must, however, be felt that the lighting difficulty has not received the attention it deserves as being really the pith of the whole problem. Suppose that the convex surface of the spherical dome, as seen from the exterior, is endowed with the importance and dignity that is consistent with the magnitude of the structure of which it forms part. Then, by nineteenth-century reasoning, the inside surface of this identical shell is unsatisfactory by reason of the unpleasant visual exertion required to grasp its contour — a disadvantage due to the great distance from the dome to the level of the inside pavement. How can it be otherwise, when the dome-shell, even on the St. Paul's plan, is in semi, if not complete, darkness? — a defect undoubtedly due to the system of admitting the light at the wrong place. There is a great deal to support this view.

In the opinion of many, there is no dome interior that satisfies the canons of artistic taste so completely as that of the Pantheon at Rome, an interior lighted directly from the sky.

Again, by universal consent, there is not a more inartistic and depressing dome exterior than that of the same Pantheon at Rome.

The evil effect of the flattened appearance of the exterior and its piled-up abutments has been a more powerful factor in modern dome-construction than has the principle, almost divine in its simplicity, of admitting the light direct from the heavens. The former has generated the dual and triple constructions of St. Peter's and St. Paul's and most subsequent domes, while the principle of lighting from the eye of the dome has not been perpetuated with success.

It is not suggested that the great value of top-lighting for the dome has not been fully realized, but, rather, its non-adoption has been due to the concomitant difficulties having proved too much of an obstacle to its realization? What are these difficulties?

In the first place, artistic and even religious sentiment demands that the apex at the crown of the dome shall be surmounted by a lantern erection so as to annihilate the Mahommedan associations attaching to a bald domical sphere. But this very lantern as now built obstructs rather than lets in the light.

With the example of St. Peter's before him, no dome constructor has again ventured to support a lantern erection upon a single, spherical, masonry or brickwork-coffered dome.

And however we may marvel at the unique construction of the great Sir Christopher, no architect of the present or coming centuries will venture to make such a large draft upon labor and material as was made in the construction of the three roofs to cover the one floor area of St. Paul's.

Granted that for architectural reasons the lantern is essential. Then such lantern must be of such a design and of such a size that it conveys a bright strong light from the heavens to the dome interior. If this can be done the need for the dual system ceases to exist. Now the difficulty of carrying a heavy load in the shape of a large lantern at the apex of a spherical dome has hitherto proved insuperable. It will remain so while stone or brick is relied upon as the sole medium of construction.

The materials hitherto composing domical construction, though possessing a full complement of compressive strength, have not possessed that cohesive strength and tensile resistance in sufficient abundance to resist the aggravating bending moments set up by a load at the apex of the dome.

It will here be a fitting opportunity to review the mathematical theories involved in dome construction. So few investigators have brought their work to a practical conclusion, and fewer still have arrived at conclusions that are of the slightest value to the practising architect, that a résumé is not a formidable task. Upon the writings of Rondelet and Venturoli are based the calculations to be found in Gwilt. Mr. Merrifield read a paper, many years ago, before the Royal Institute of British Architects upon the dome of uniform stress, which showed the shape to be a parabolic cone — a conclusion already arrived at by Wren in designing St. Paul's. Lastly, Mr. Wyndham Tarn has put on record his views. His results, if anything, are more useful than those of the former writers, although he goes about his calculations in a similar manner to the method of Venturoli. His opening steps are common knowledge, and may be followed by any student. By the simple laws of mechanics it is shown that there are two forces generating moments about every point in the arch ring of the dome resting upon an abutment. These forces are the thrust at the crown acting with a leverage about each point in the arch ring, the amount of the leverage varying as the point under consideration alters its position, and the weight of the half arch acting also with varying leverages about different points.

It must be patent to an observer that there is some point in the dome where the effect of the thrust is greatest — in other words, where the dome is weakest.

The question arises, where is this point? Mr. Tarn, in a purely mathematical enunciation and proof, in which trigonometry, the calculus and the higher algebra involving cubical equations are introduced, demonstrates unquestionably, from pure mathematics, that the thrust is a maximum at a point twenty degrees from the springing and seventy degrees from the crown. This may be accepted as reliable, insomuch that on reference to some experiments made by a Mr. Bland on arches composed of wood voussoirs, after careful observation, it was seen that the voussoir first to give way under the thrust was at a point corresponding with Mr. Tarn's mathematic conclusion. At this point, of course, in a masonry dome the chain would be placed as has been pointed out.

Given the respective radii of the interior and exterior of a dome-shell, together with the weight of the masonry per cubic foot, the height of the pier, and, lastly, the amount of the thrust at the crown — then from Mr. Tarn's data it is easy to calculate the amount of thrust passing from the dome to abutment, and the thickness necessary at the abutment to obtain equilibrium and also stability.

A remarkable dome is that over Sultan Mohammed's tomb at Gol Gomuz, at Beejapore. As far as our knowledge of it is correct, its construction is opposed to all modern ideas of good design, the thickness of the shell at the crown being no less than eighteen feet, and diminishing at various stages to nine feet six inches at the abutment. Whether it is solid at the thickest part is not known to the author; anyhow, it is the soundest dome existing without extraneous aids at the present time.

The days of masonry and brick domes existing solely as such are numbered, if not even now at an end. And if a dome, such as has been indicated here, can be constructed (and there is no reason why it should not be) satisfactorily from an architectural point-of-view, when viewed both internally and externally, supporting a suitable and effective lantern erection, then the dual construction which has been the great bar to domical roofing development will be superseded, and an architectural sham be abolished forever.

The question naturally arises, how can this be effected? The following suggestions have been roughly sketched out:

The introduction of metal into masonry dome construction has had a precedent for a century past in the presence of the iron chain. But suppose the chains are entirely done away with and a series of iron ribs are fixed radiating from the eye of the dome, formed by a circular metal curb and abutting upon a similar curb at the base, the whole cross-braced and tied and fixed upon expansion-rollers. By such an erection a framework would be obtained, which could be calculated to resist any bending moment that might be brought upon it by a superimposed lantern, and no thrusts would be transmitted to the drum or abutments. The scheme for covering the metal framework is not a new one, insomuch that it was suggested some years back to construct a dome entirely of terra-cotta. The idea of the author is that terra-cotta would form a very suitable material for casing the whole of the metal framework internally and externally alike: by blocks interlocking and treated architecturally inside, with overlapping joints externally.

Such a construction would produce a dome which, if suitably treated internally, would be satisfactory artistically, and constructively exceedingly economical, compared in the light of the present accepted modes of dome construction — proof alike against fire, frost, and the dreaded hand of time.

A few domes are illustrated upon the screens. That of Sta. Maria della Salute, Venice, of which there is a near view and a general one, exhibits an arrangement and general design that is peculiarly graceful externally.

The remarkable central protuberance on the dome over the Pisa baptistery is a feature more unique than elegant. To it may be traced, perhaps, the bulbous roof terminations on some Belgian and North German cathedrals.

In drawing attention to the collection of photographs in this hall to-night, comprising as they do examples of many of the principal phases of tower, spire, and dome design, I would venture to say that they are a unique set. They form part of a fine collection gathered together in the course of some forty or more years. This portion numbers some 240 views. I feel the whole meeting is indebted to the gentleman who has placed these views at our disposal, Mr. James Cubitt, in whose service it has been my privilege to spend some little time. He published, seven years ago, some notes upon tower-design, in which were classified towers of the Romanesque and Gothic styles under two great heads — towers with super-towers and towers without super-towers. Under these two divisions come some hundreds of types classed according to their plan, their roofing, their buttressing, etc. On the tabulated diagrams are scheduled the places where examples of the several types are to be found. The arrangement will repay careful study, and in thus directing attention to these views my paper concludes.

THE WASHINGTON WATER-WORKS TUNNEL is again before Congress in the form of a resolution presented in the House, on January 25. Quoting the experts' report as proving that the tunnel is absolutely worthless, and that the $2,575,279.30 expended on this work is without return to the city in the form of an increased water-supply, the resolution requests the Secretary of War to inform the House whether the contractors and subcontractors for the work of lining the tunnel can be held individually liable for the loss incurred. Also, whether they can be criminally prosecuted. If this resolution is pushed it will open up some nice questions concerning the relative responsibilities of engineers and contractors. — *Engineering News.*

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CANADA

A COMPETITOR SUES A BUILDING-COMMITTEE. — SCAFFOLD-ACCIDENTS. — THE PROVINCIAL ESTIMATES. — PROPOSED PUBLIC BUILDINGS.

A CURIOUS case has lately been before the courts of Montreal, in which the apparently unfair dealings of a competition-committee with one of the competitors was the cause. It seems that the Governors of the Insane Asylum advertised for drawings from architects for a new asylum, the total cost of the building not to exceed eighty thousand dollars. The plaintiff in the case was a Mr. Walbank, architect, of Montreal, and he sued the Governors to force them either to submit his plans to the experts named or pay him the full value of his plans, or, in other words, to carry out their own conditions or pay him. For some reason or other not mentioned, the drawings sent in in competition were not submitted to the experts, so that, in fact, there was no competition, but the Governors instead gave the building into the hands of their own architect, who, at the trial, said he had been employed without reference to the competition. Mr. Walbank, as a competitor, sent in, under seal, an estimate made by a contractor of the cost of the design, and this envelope was opened by the Governors at their meeting, although marked "not to be opened unless plans are accepted," and the Governors made use of this so far as to make notes from it and enter them in their minutes. And now comes the extraordinary part of the matter, the bearing of which upon the subject one can hardly comprehend. Judgment was given in favor of the Governors because it was held that Mr. Walbank had not proved that the designs could be carried out for eighty thousand dollars. Although Mr. Walbank sent in, under seal, a *bona fide* tender, and although it was proved that the Governors had seen this, yet it is stated that there is no proof on the matter, and on that count alone the verdict must be against the plaintiff. The court says nothing about the Governors not complying with their conditions, but comes down upon the competitor on an outside point. The defence of the Governors seems to be that they could do what they pleased with the design sent, not according to their conditions, while Mr. Walbank maintains that their conditions were fulfilled by him, and, therefore, demands that they (the Governors) should be made to fulfil them themselves. It is said that this case will be appealed, and it is to be hoped it will — Montreal justices seem to be altogether at sea with regard to professional customs and practice.

The continual accidents to workmen through defective scaffolds are attracting a good deal of attention in Toronto, and there are a good many schemes suggested as means to prevent them. One idea is to make the master-builder responsible for the safety of his workmen, another is to employ another inspector whose duties shall be entirely devoted to the examination of scaffolds, while a third is to make responsible the men who build the scaffold: one and all are equally impracticable. A master-builder has more important things to watch than the temporary staging erected for the use of the men. If he provides them with sufficient planking, posts and ropes, he has certainly done his duty. One inspector would never get through half the scaffolding erected on any one day, not to mention the necessary inspection, perhaps three times a day, of scaffolding that had to be enlarged or raised in the course of that day. An inspector would be an expense to the city even were one sufficient; the city would then be responsible for accidents to scaffolds supposed to have been inspected, or all work would be delayed at a building until the inspector had certified that such a scaffold was safe for the men to venture on. The third idea, that of making the men responsible, is the best, but it is altogether impracticable; workmen are proverbially careless and you cannot teach them to be careful. There is really nothing to be done in the matter if the men will go on scaffolds they have sense enough to know are unsafe, they must take the consequences; there is no law to make them endanger their lives by venturing on flimsy structures, but, if they will not use their common-sense, it will do no good to treat them as children and give them a scaffold nurse to look after them.

Since my last letter the International has appeared, and really the first few numbers took away one's breath, but now one is getting accustomed to the weekly flood of illustration. To look at one's *Architect* is not now a matter of a few moments. It takes time even to look through it, not to mention to study it, while in the great variety of the subjects each week every individual who sees it must find something that interests him particularly.

The Dominion and Provincial Parliaments of Canada have "knuckled down" to work, and the end of last month (January) saw the announcement of the "estimates" for the year. A casual glance, not at the figures of the amounts devoted to public works, but at the various items upon which the money is to be expended, clearly shows how great and rapid is the progress of "civilization" throughout the Dominion. The number of post-office buildings to be erected in various small towns, varying in cost from $8,000 to $15,000 each, shows this better than any other item, for a town must be founded and developed, and must exhibit very decided evidence of its future progress before it can be entitled to have a special building given to it for postal facilities.

The sum of $5,000,000 is devoted to railways and canals, of which the River St. Lawrence and the western canals get $1,000,000.

Grants of large sums are voted for "public buildings" (which means municipal offices) in various places which, having formerly reached the "post-office stage," have progressed to a degree entitling them to city-halls. But the architects of the Province of Ontario have a special interest in the session of their local parliament, on account of their Bill of Registration. There is, however, likely to be a dissolution about the middle of next March which may delay considerably the legislation they are anxious to obtain.

LONDON

THE ANNUAL PRIZES AND MEDALS. — ELECTRIC-LIGHT AT THE BRITISH MUSEUM. — IMPROVING THE STRAND. — HOUSES FOR WORKING-MEN. — THE WATKIN TOWER.

THE competition for the annual prizes at the Royal Institute of British Architects has hardly brought forth such good work this year as is usually the case; indeed, two of the principal prizes were not awarded. The Institute Medal and £26-5-0 attracted no competitors, and the judges did not consider the work submitted for the Soane Medallion of sufficient merit to justify their awarding the prize. One of the competitors might have received the laurel-wreath had he not yielded to a temptation to be original, and submitted a perspective sketch of a highly sensational character. Sensationalism does not meet with favor at the Royal Institute of British Architects.

The Tite Prize does not call for any special mention. The Grissell Medal, for a design for a timber spire, attracted eight competitors: one extremely clever design was submitted by Mr. W. Percival. The Pugin Studentship was gained by Mr. John Begg, who follows in a minor degree the style of draughtsmanship inaugurated or revived by Mr. A. B. Mitchell, of washing-in his shadows in light washes of lamp-black. He does not, however, pursue the idea so far as Mr. Mitchell is wont to do, but by his moderation obtains, as is very justly pointed out in the *Institute Journal of Proceedings*, a more delicate and refined result.

Results of the travels of last year's students were shown by the sketches of Messrs. Mallows, Prentice and Lanchester. Mr. Mallows is, I believe, an American. Anyhow, he enjoyed the great advantage of having studied under Mr. Joseph Pennell, whose influence is very notable in some of his sketches. Mr. Lanchester took the Owen Jones Prize for Color Decoration last year, and sends a collection of really most beautiful studies in color from North Italy. The prevailing tone of his work is rich to a degree almost sombre, but they are full of true artistic feeling.

There was a new prize offered this year for models of a vault in plaster, and the prize was taken by Mr. H. A. Woodington, for a very painstaking piece of work.

The Ashpitel Prize, given to the "Senior Wrangler" in the Examination in Architecture, was won by Mr. Herbert Baker, a son, I believe, of Mr. Arthur Baker, F. R. I. B. A., who has done a great deal of good work. Mr. Baker is in the office of Messrs. Ernest George & Peto. This is the first time the Ashpitel has been awarded to a London student for three years.

On Tuesday, January 28, there was a large gathering at the British Museum to witness the first public illumination of the Greek and other galleries by the electric-light. On February 1 the Museum will be thrown open to the public between the hours of eight and ten in the evening. This is, of course, a great boon to architectural students, most of whom are busily engaged in offices during the day, and to whom the Museum has hitherto been practically inaccessible except for an hour or two on Saturday afternoons. Now it is open for them to go and draw any evening at their leisure from the priceless Elgin marbles and other examples of Greek art in the Museum.

The London County Council have prepared an "Amendment" to the Metropolitan Building Act for submission to Parliament during the coming session. The chief points of interest to architects are:

(*a*) An appeal is given from the superintending architect's decision in matters of frontages to a tribunal composed of one member appointed by the Council, one by the Royal Institute of British Architects, and one by the Surveyor's Institute. At present, the decision of the superintending architect in these matters is final and decisive.

(*b*) A clause is inserted that no building shall be erected higher than seventy feet without the consent of the Council.

The "Strand Improvements" Bill will also come before Parliament this session. I have already informed you as to the causes

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which led to this Bill and its nature, but I do not think I have ever referred to a peculiar principle which the London County Council have embodied in the Bill. It is quite a novel idea, but is hardly being treated tenderly by the British public. The argument of the promoters of the Bill is, that in consequence of the action of the Council in cutting an important thoroughfare through a network of slums, the value of certain of the slums is immensely increased, whereupon the Council seek to impose an annual rent-charge upon all property within a given area which they have somewhat arbitrarily defined. The clauses have been termed the "betterment" clauses. Naturally the owners of property in the district object very strongly to any such proposition, and their influence has been sufficient to induce the Strand-District Board of Works to oppose the Bill in Parliament. It has always been an understood thing in England until now that if a certain property was benefited by a public improvement, so much the better for that property, and the suggested innovation of the London County Council betokens a spirit of unnecessary meanness which can hardly be called economy.

The housing of the working classes has again been receiving a share of public attention. The munificent bequest of £250,000 by Sir Arthur Guiness is partly the cause of this. People are anxious that the Peabody fiasco should not be repeated, and that the money should really benefit the very poor for whom it is intended, and not simply enable clerks and respectable artisans to live at a cheaper rate than they otherwise would have done. Another thought has somewhat agitated the minds of certain people who know a little about artisans' dwellings. At the present time these dwellings, carefully built by experienced men and well-administered afterwards, can be made to pay from 4½ per cent to 5 per cent at an average weekly rental of 2*s.* per room. Now, if it is the intention of the Guiness Trustees to adopt this rental, where do all the vaunted benefits of the trust come in? If, on the contrary, they lower it, they will inevitably not only set up a most undesirable competition with those who have borne the burden and heat of the day, but also frighten away from the market money that might otherwise have been invested in a safe, if not a brilliant, investment. The administration of this trust seems to be fraught with the gravest difficulties.

An evening paper reports that there are some hundreds of competitors in for the Watkin Tower which is going to be forced upon us in England, partly, it seems, for the deification of Sir Edward Watkin. There appears to be a reasonable chance of the erection proving a financial success, and if legal difficulties do not prove too great for the promoters of the tower, up, I suppose, it will have to go and stand there alone in its gaunt ugliness, a standing tribute to the utter depths of childishness to which modern Englishmen can descend.

PARIS

THE ARCHITECTURE OF THE FRENCH COLONIAL SECTIONS. — THE SPANISH PALACE. — THE PAVILIONS OF COCHIN-CHINA AND ANAM. — THE PALACE OF HYGIENE. — THE ATTENDANCE.

WE must make an end of these descriptions of the Paris Exhibition, for it closed on the 6th of November, although there are many things which we have not yet spoken of; but as it would be fatiguing to talk about things which have already partly disappeared, we will rapidly review those buildings which still remain unmentioned.

Before leaving the Champ de Mars let us cast a glance at the Rue de Caire, whose success has been prodigious, and which every day during six months was crowded to the very verge of putting a stop to all circulation. The idea of the Egyptian exhibit and the plan of the Rue du Caire was due to M. Delort of Gléon, commissioner-general, who had for his objective point to give Paris a specimen of the Arabic art of the caliphs, — but not an absolutely exact reproduction of one of the real modern streets.

The Egyptian section covered about 3,000 metres and was divided into two parts. First, the Rue du Caire, properly so-called, and second, the exhibit in the galleries of the palace which contained shops and bazaars. The street was composed of houses with bizarre and irregular façades, with balconies and projecting moucharabiehs. It formed a very gay perspective, full of movement, the principal feature of which was a minaret, recalling, at the same time, that of Caid Bey and that of Sultan Hassan. All the details of ornamentation, faience, stuffed crocodiles and moucharabiehs were imported from Cairo. One quite believed himself in Egypt when, in full summer daylight, the projecting stories and the moucharabiehs with their delicate windows threw their long shadows upon the shops of the lower story with their colored awnings. The oddly dressed merchants completed the charming illusion. Passing rapidly through the Morocco exhibit, which does not long delay us and presents little interest from the point-of-view of construction, since it is merely composed of arcades sheltering bazaars and a café-concert, let us cast a glance at the Roumanian cabaret, all of woodwork, all of original and varied form, and recalling the pretty architectural fantasies of M. Sauvestre; and then let us stop before the Indian palace. This is composed, inside, of a long gallery interrupted at its middle by a rotunda decorated with a fountain and with a balcony at the first story. Bazaars and small shops are in this gallery, and on the outside a veranda, resting on squat columns with curiously sculptured capitals, runs the full length of the building. The general effect is massive, and the entrance is emphasized by a large projecting doorway, flanked by two minarets. In general it recalls the architecture of the fifteenth century, which was a transition between the Buddhist and the Mussulman styles. The decoration, obtained in the first place by a succession of red courses interrupted by friezes of fine sculpture, was copied after the buildings of that epoch and models at the South Kensington Museum. The sculptures of the veranda were inspired from Taj Mahal, at Futtipoor-Sikra, while the minarets are from the mosque of Ahmedabad, and the central rotunda of gay and elegant appearance has its columns copied from those of the Mosque of Katub at Delhi.

On the other side of the Pont de Jena we could not overlook the pretty forestry pavilion built by M. De Gayffier, Conservator of Forests, and M. Lucien Leblanc, with every kind of wood which grows in France. The architect had the ingenious idea to use the wood in its natural state, and seek his decorative effects through the natural differences between his woods and the diversity of their colors. The columns are formed of tree-trunks with the bark on, and for them were used some of the most beautiful specimens of our forest trees.

The pavilion of Public Works, which was *vis-à-vis* to it, had quite another air. Everything was of brick and iron, and was surmounted by an ungainly light-tower, which, nevertheless, afforded an agreeable outlook over the garden of the Trocadéro.

Going to the esplanade of the Invalides by the quay we discover certain other interesting buildings. First, the Palace of Alimentation, by M. Raulin; all of iron, with a very rich decoration in stucco. At its side and connected with it the Portuguese Palace, by M. Jacques Hermant, a very charming building in open-timber work covered with sheet-metal and with sculptures in stucco. The style (Portuguese, Louis XV) is inspired from the hotels at Coimbra and the buildings at Lisbon. The pediments over the windows are decorated with the arms of Portugal and the family of Braganza. A loggia looks out over the Seine, and reminds one of the arches of the cloister at Belem. We thus reach the foot-bridge of the Alma, which connects the galleries of the exhibition with the quay d'Orsay, interrupted by a long open square. This bridge is borne on an arch twenty-seven metres high and fifty metres in clear span, which allowed a large open space for the enormous crowd of foot-passengers and carriages which collected at this spot. Two staircases of forty-two steps each ascend to the bridge-floor seven metres above the ground. At each side of the arch four pylons rise to the height of thirty-six metres. The summit of the arch itself is decorated with the escutcheons of every department of France and the flags of all foreign nations. This bridge was carried out under the direction of M. Charles Gauthier, who was also the author of the memorial bridge which serves as entrance to the exhibition from the esplanade of the Invalides.

Crossing into the Agricultural galleries we notice the Spanish palace, constructed by M. Melida, a Madrid architect, and M. Poupinel, of Paris. Intended to receive wines and alimentary products it consists of two stories, the lower one of which is arranged like the Spanish wine-vaults. The decoration is managed by pilasters and octagonal columns, the capitals of which, of three different types, are those of Santa Maria la Blanca, of Toledo. In the upper story the rooms are large and well lighted. The ceiling of the central hall is an exact reproduction of the ceiling of the Sinagoga del Transito at Toledo. In Spain there are some monuments built at the same time, but composed of very different styles. At the end of the fifteenth century and beginning of the sixteenth, the Arabic style was influenced by the growing ascendancy of Christianity. This style is called Mudjar. Then the Gothic style flourished, and next came the commencement of the Renaissance style called Plateresque, because it was imported by the silversmiths who had come from Italy. These styles of different characters give the Spanish palace an unbalanced air but interesting, as they show differences of style little known in France.

Reaching at length the esplanade, we have arrived at the last, but not the least interesting, halting-place of our visit to the Exhibition. It was one of the successes from every point-of-view: this superb colonial section united in fact all possible elements that could attract the crowd. It offered a curious spectacle of indigenes transported with their dwellings and their costumes, and living their ordinary life, with their own customs and habits and even their own religious rites. Artists and men of letters found here subjects of study and analysis, and carried their investigations farther than the ordinary public. But for the architect how many subjects were offered for reflection in this primitive architecture, inspired from authentic monuments, or reproducing completely certain portions of existing edifices!

In the exhibition of Algeria, the most important of our colonies,

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the palace is composed of several specimens of the Algerian style, not Arabic, as has been carelessly said. The entrance is through a porch with three arches under a projecting pent-roof copied from the tomb of the last Dey of Constantine in the mosque of Sidi-Abd-er-Rahman, one of the most celebrated in Algiers. It was erected in honor of the Marabout Sidi-Abd-er-Rahman, who, according to popular legend, raised the waves which engulfed the fleet of Charles V by simply touching the sea with his wand. The minaret at the left of the entrance is an exact reproduction of the minaret of the same mosque, with all its faience work. It encloses a staircase which recalls that actually in use in the mosque at Algiers, and which gives access to two rooms, supported on corbels, and connected together by a wooden balcony on the interior of the dome upon which the entrance porch opens. This dome ("Kouba"), which is a copy of that of Sidi-Abder-Rahman, is the entrance vestibule, and its centre is occupied by a very commonplace statue, by M. Gauthier, sculptor, representing Algeria. The vestibule gives access to a long gallery, at the extremity of which is found the Hall of Honor. This gallery is charming, with its Moorish decorations, its sculptured piers covered with geometrical arabesques and its ceiling, which allows the entrance of light through the glass, bright with colors. This hall of honor is very richly ornamented, and the decoration of its ceiling is borrowed from the Archepiscopal Palace at Algiers. This portion of the Algerian palace has a very Oriental character, which we do not find, at least within the building, in the three bays of the grand hall, situated at the left of the gallery, which are devoted to the exhibits of Algiers, Oran and Constantine. At the right, porticos and bazaars enclose an interior court, which contains a pretty tile-work fountain in the Moorish style, shaded by palm trees and decorated with Algerian plants. Here are gathered an extraordinary crowd of native merchants and weavers of stuffs who do their work in public. The portico ends on the garden side in a little square pavilion covered by a dome ornamented on the inside with green tile-work. At the other end it butts against another pavilion of more importance. This pavilion is a reproduction of the Pavilion of the Fan at Algiers, where the Dey gave the French ambassador the buffet which brought about the conquest of Algeria.

Faience plays a great part in the general decoration of this pretty place. It is due to M. Albert Ballu, architect, ably seconded by M. Marquette. This faience is of French make, but draws its inspiration from the Italian work of the same kind which is much used in Algeria. The lining of the basement of the principal entrance, which was designed by M. Parvillée, has been executed by Fourmintrau-Courquin. This very brilliant and very elegant entrance recalls the Mihrab of the Mosque de la Pecherie with its adjacent windows.

After Algeria, fronting on the central avenue of the esplanade, rises the Tunisian palace, composed in a very interesting manner by an archæological architect, M. Saladin. This artist particularly studied the country where he once discharged important duties for the Ministry of Public Instruction and the Fine Arts, so he has very ably grouped in the palace the different types of Arabic and Tunisian architecture. We approach the palace by a wide flight of steps, on which the three-arch portico, sixteen metres long by six and one-half metres deep, opens and surrounds an interior court-yard nine metres square, paved with ancient mosaics, and in the midst of which stands a fountain. This is the "*patio*" of the Arabic palaces of Tunis. At the right of the square a flat-roofed pavilion is a reproduction of the Souk-el-Bey at Tunis. The arcaded bay filled with windows and ornamented with colonnettes occupies almost the full width of the pavilion, which on the other side is lighted by a mouchárabieh. On the left a second quadrangular pavilion with a pyramidal roof draws its inspiration from the tomb of Sidi-ben-Arouz at Tunis. The lateral façades, are composed of elements drawn from the Bardo and from Dar-el-Bey, and the rear façade, of a more varied character, has been borrowed from the Mosque of Kerouan (Sidi-Okba), with the ribbed dome so peculiar to the Tunisian style and which crowns the cupola which surmounts the Mihrab of the grand mosque. At the left of this rear façade rises the minaret and a school-house. The decoration of the interior court-yard is particularly noticeable for the faience work which comes from the palace of the Bardo. The ceilings are ornamented with designs sculptured in intaglio and painted in brilliant colors, and form a whole of great richness and very marked Oriental character. The fountain which occupies the middle of the court-yard is surrounded by a pavement of ancient mosaic fragments, and in them we can admire other fine examples taken from the tombs of Sbeitla and Lamta.

About this central pavilion are several interesting structures: first, a brick house from Djerid, of great originality of character, and on the other side the *souks* or bazaars. These are like long corridors, on either side of which are raised cases, serving as stalls. They are open alike on the outside and inside, and are protected from the sun by unbleached awnings. Here we see the occupants at work on embroideries, damaskeening, jewelry-making and cabinet-making. The perspective of this *souk* is a charming spectacle, with its columns striped with red and green, and brilliant with stuffs, the glitter of jewels, silverware and copper utensils; but all these brilliant colors, all the red and the gold, clash against one another in the brilliant rays of sunlight which creep between the openings of the awnings.

Without being distinctly of any style, the Palace of the Colonies has the general air of a building which would not be out of place in the land of the sun, with its somewhat brutal decorations and its lively red and green colors. The windows break through the roof, the bell-towers at the angles, and the dome give to the Colonial Palace a varied *silhouette* and movement in spite of its rectangular form.

About this central palace are grouped the pavilions of Annam, Tonquin and Cochin-China, the pagoda of Angkor, the Creole restaurant and various Asiatic and African villages, where exotic productions are sold.

The Javanese village, whose success has been so great because of the pretty little Javanese dancers, comes next. Of all these different buildings, two are particularly remarkable for their architecture and the richness of their decorations, these are the pavilions of Cochin-China and of Anam and Tonquin. The first occupies an area of about 1,200 square metres. It is composed of a principal building with two wings enclosing an interior court-yard, which is obligatory under the customs of the country. A fountain, some shrubs, vases and a faience dragon furnish the decoration. The entire construction is of wood carved in a remarkable manner. The entrance, with its projecting roof supported by great consoles of wood, is a marvel of fine workmanship. The plaster basement is covered with paintings executed by the Anamese artists on the spot. Nothing was more curious than to see these people compose their decoration without models and without documents of any kind. They drew with the brush-point and at the first go-off, images conceived in their imagination, images representing flowers, animals and human beings. Fragments of faience buried in the plaster became, under their able fingers, plants and fantastic branches of shrubs, and all formed a very decorative whole. A magnificent enamelled terra-cotta cresting, twenty metres long and three metres high, crowns the pavilion of Cochin-China. This beautiful morsel, with figures and animals very curiously incised, was made at Chô-Lon. First built in its own country, this very interesting building, which it is hoped will be preserved, was set up in a few weeks by a gang of Anamese workmen under the direction of M. Foulhoux, Director of Civil Buildings in Cochin-China.

The pavilion of Anam and Tonquin is less fine in detail and construction, but wood here plays a principal part. It has the ordinary pagoda form, and is built on a square plan, with an interior court-yard, in the centre of which is placed a cast of the great Buddha of Hanoi, Tonquin. The principal entrance is a reproduction of that of the pagoda at Quan-Yen. As to the rear and side doors, they are inspired after beautiful specimens of Tonquinese architecture. The paintings, tile-work and sculpture have been cast at Hué from portions of the palace of Tien-Tri, Tu-Due, Gia-Long, etc., through the enterprise of M. Vildieu, architect. This pavilion, like that of Cochin-China, was executed in its own country at Saigon. The carpenter-work, cabinet-work and the paintings were made at Paris by the Anamese artists we have already mentioned.

This magnificent colonial exhibition has as its *vis-à-vis* on the side of the esplanade a series of structures of quite a different air. These were the buildings of the Exhibition of Social Economy, rather uninteresting from an architectural point-of-view. The Palace of Hygiene is more attractive. The architect, M. Girault, gave it the form, on the outside at least, of the Roman baths. This seems rather irrational, considering that this building was to shelter the appliances of modern hygienics.

By the side we find, in a special pavilion, the apparatus of Messrs. Geneste & Herscher, who, from the point-of-view of the sanitation of cities, ventilation and heating, have made immense progress.

Finally, to end here, here is the Palace of the Ministry of War, which stretches to a length of 150 metres. It is an immense structure in the style of Louis XIV, of which the central doorway is treated like a Corinthian triumphal arch, and the two extremities of which are accentuated by two great *motifs*, which recall the Porte St. Denis. The general aspect is imposing, and the detail is well studied. It is not absolutely ugly, but it takes up too much space.

It is this monument of M. Walwein, architect, which closes our rapid review of the buildings of the Universal Exhibition of 1889, which has seen gathered within its limits an average of 150,000 visitors a day, which gives a total number of 25,000,000 of attendants. This is more than double those in 1878.

THE HAWKSBURY RAILWAY BRIDGE. — THE "GREAT ZIG-ZAG." — THE BUILDING OPERATIONS OF THE ROMAN CATHOLICS.

SYDNEY, N. S. W.

THE Hawkesbury Railway Bridge, mentioned in my last letter, is one of two engineering works of which New South Wales is justly proud. This bridge crosses the river at Peate's Ferry, and was formally opened in the early part of last year. There are seven spans of over 400 feet each, and the stone piers on which they rest are built on massive caissons filled with concrete, the depths varying from 100

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to 172 feet. Each of the spans was constructed on a large pontoon provided with water-tight compartments, and surmounted by an enormous staging capable of sustaining the whole weight of the ponderous mass of metal-work, and somewhat higher than the piers of the bridge. This pontoon was sunk close inshore by opening the valves of the water-tight compartments, and the span was then put together and completed on the top of the staging. When everything was ready the compartments were again closed, the water pumped out, and the pontoon rose gradually to the surface and floated there. At high water it was then towed down between the piers on which the span was to rest, and, as the tide fell, the girders settled slowly onto a properly-prepared bed; then the pontoon, released from its burden, was towed back to its former moorings and made ready for receiving the subsequent spans. The total length of the bridge between the abutments is about 2,900 feet, and it is raised about 50 feet above the surface of the river. As I mentioned before, an American firm of contractors carried out the work, but the girders used in the construction were imported from Scotland.

Our other engineering triumph is of much earlier date, and is known as the "Great Zig-zag." In constructing the railway across the Blue Mountains, the ascent was found to be so abrupt that it was decided to carry the line up a series of inclined planes till the crest of the hills was reached. Thence it winds along the summit of the main range, ascending continually, for a distance of 60 miles, till it arrives at the farther side of the mountain barrier, and then the descent onto the Western plains is commenced. It is here the second series of inclined planes (which we call the Zig-zag) has been constructed, by means of which a precipitous fall of 700 feet is traversed by easy gradients. The cost of this work averaged nearly £23,000 sterling per mile, and from this some estimate may be formed of the difficulties which had to be surmounted.

The Roman Catholics here are gradually covering the best sites in the city and suburbs with their churches, schools and colleges. The Education Act in force in New South Wales recognizes no sect or creed, and the instruction is purely secular. The Catholic Church claims that, if not inculcated as a part of a child's education, religion is too apt to degenerate into indifferentism, if not atheism; they have fought, therefore, for the denominational system for many years, but their struggles have been unavailing. They have now abandoned the conflict, but their position remains unaltered. They have accordingly set to work and built themselves splendid scholastic establishments all over the colony, which are paid for and supported by the voluntary contributions of the members of the Church. The fees are almost the same — that is, merely nominal — and the tuition quite equal to that imparted in the public schools. Besides the fine Catholic Cathedral, which is barely half completed, and which has already cost upwards of £200,000, we have a large Catholic seminary at Manly, which is undoubtedly one of the best ecclesiastical buildings in Australia. Then the Jesuits have built, and lately opened, a grand college on one of the most picturesque sites about Sydney, and on Sunday last was laid the foundation-stone of another college, equally large, for the Marist Brothers. The Jesuit College, architecturally, seems well adapted for its purpose, but entirely unsuited to the site. It is a building which would look well in a crowded city street, and is, consequently, unfit to be set on a bold headland, against a background of dense foliage.

There is little else worthy of record just now; in fact, we have arrived at a period of almost utter stagnation so far as professional work is concerned. Our business has been steadily decreasing month by month, until now there is absolutely nothing doing in most of the architects' offices. The tide of our affairs is about to turn, though, we are told, and, if we can only hold out long enough, we may meet the flood which is to carry us on to fortune. May that flood come speedily, for life is becoming terribly irksome to many of us who flounder in financial shallows.

THE ANNUAL EXHIBITION OF THE PENNSYLVANIA ACADEMY OF FINE ARTS. — MR. KIRBY'S DRAWINGS — WATER-COLOR SKETCHES AND COLORED DRAWINGS.

WITH one or two notable exceptions the architectural exhibition at the present Sixtieth Annual Exhibition of the Pennsylvania Academy of the Fine Arts is much more purely local than usual, or rather is much more than usual the work of local men, for a large proportion of the drawings shown were made abroad. Very unfortunately many drawings shown at the Architectural League Exhibition were unaccountably delayed until too late, and are, therefore, not in the Academy. The most important exceptions to this rule are the twenty inimitable drawings by Mr. H. P. Kirby, several of which were in the League Exhibition. A note in the catalogue tells us that Mr. Kirby's drawings "are here for a limited time, through the courtesy of the artist and of the Boston Architectural Club, a private exhibition already arranged by the Club for Mr. Kirby having been postponed in order that the drawings might be shown here." Unlike the pen-and-ink work of a good many well-known draughtsmen, these superb examples command more admiration in the original than in any reproduction; the line is as firm as true, and as delightfully free when it wanders over a square yard of paper as when it is confined within the boundaries of a quarto volume. If we cull out the least characteristic pieces, the studies for a cottage and a gate-lodge, and perhaps the interior sketches, it is hard to tell which of the others attract us most, There is the noble drawing called a "Study for a Country House," the less imaginative, but still fascinating country house with its arch over the roadway on the left, the seaside house, the sketch (in brown ink) for a club-house — possibly this is the best of all, although without any dominating mass which would have helped it as a composition — this rambling club-house, partly Gothic, partly Renaissance is altogether delightful. Then there is the well-known sketch for a country tavern and the study for a hotel in Colorado, a design in French Renaissance for a building that if it exists must make an architect think twice before going to France in search of picturesqueness. One wonders to what use the ill-lighted rooms in the round towers will be put and the front-door strikes certain fault-finding people as not being conspicuous enough; but small entrance doors and large chimneys are characteristics of Mr. Kirby's designs, and in the presence of drawings like these one ought not to feel hypercritical.

All the drawings are admirable, the sketch in St. Lizier, the clearly drawn corner in Bayeux, the mass of rich detail in the study for the tower of the court-house and jail, and the fascinating compositions and views in imaginary French towns. One feels the strongest desire to see the whole of the church whose spire is the feature of one of the sketches, and in another to know what may be hidden behind the half-timbered gables above which looms the noble tower of a rich cathedral.

From the numbers of draughtsmen who have been seen apparently taking mental notes from these drawings, it seems as though Mr. Kirby might have many imitators, and the next exhibition may contain as many pen-and-inks after the manner of Kirby, as there are generally to be found of water-colors after the manner of Luce. It would seem — and this I think a pity — that the influence of the school of architectural water-color, of which Mr. Luce is easily master, is somewhat on the wane. There were very few drawings that recalled his single-wash style at the Architectural League Exhibition this year, and here there is only one, a water-color by Mr. W. C. Noland, of a building by Messrs. Shepley, Rutan & Coolidge. This perspective is catalogued as being colored "under direction of Clarence S. Luce," and, indeed, the rich, strong brown wash shading into blue might easily be mistaken for one of his own. Immediately over this, and occupying the place of honor on the north wall, is the large water-color that is one of the drawings with which Mr. T. P. Chandler, Jr., won the competition for the building for the Penn Mutual Life Insurance Company. One cannot help admiring this impressive building with its huge Ionic shafts brought into greater prominence by the finer detail of the imposts, and at the stage at which it has now arrived, one has involuntarily the same thought that arises on seeing the Public Buildings and calling to mind the numerous perspectives of them that flood the city — that it is a pity the tower should ever be built. Of course, there can be no fair comparison between the painted iron sham that is to dominate our City-hall and the honest stonework of the Penn Mutual Building, but the tower for the latter is not in Mr. Chandler's happiest vein, and even — if I might venture so profane a thought — verges on the commonplace. This cannot be said of Mr. Chandler's other design, a pen-drawing for the building for Brown Brothers & Company. This shows the extension of the Chestnut Street front in the same strong, light and graceful style as the present building. Next to this drawing is another pen-and-ink by Mr. Charles M. Burns, a rear view of the Church of the Nativity, at Bethlehem, Pa., showing the apse crowned by an encircling colonnade. Mr. H. Bloomfield Bare has three water-colors, English in their treatment, of more or less known architectural subjects, but his most interesting drawings, at least to architects, are two large frames of sketches entitled "Rambles in Europe." Together they include twenty-seven small sketches of towns, details, corners, churches and houses from various countries, all apparently made on the spot in whatever material happened to be at hand, water-color, pencil, Chinese white — anything, and on paper of all sorts of shades. The most pleasing of them all is a charming water-color drawing in light washes, of that most picturesque of buildings, the Town-hall of Malines. Mr. Frank A. Hayes has some water-color sketches from England and Belgium, very rich in color and boldly handled, without retouching. Perhaps the best of these is a frame of three sketches in Chester. The middle one, which has been worked very "wet" throughout, is especially successful. A pen-sketch of an old house at Kenilworth is drawn in a charming manner, but is a little smudgy-looking at a distance. Mr. Hayes also shows a good design (which has taken third mention in a late T-Square Club competition) for a fountain in a blank wall.

Mr. Wilson Eyre, Jr., has four drawings. One of these is a sheet of sketch-plans and elevations for a country-house in Michigan. The simple hipped roof covering both house and stable, the stone arch that connects the two, the loggia in the corner and a certain air of comfort and repose about the whole composition make this study

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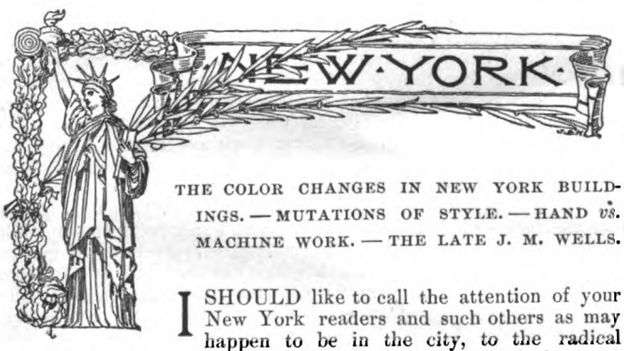
a very interesting one. Mr. Eyre's other designs are a capital pen-sketch in a few strokes of a house he is building on Locust Street, the entrance to the Walnut Street Turkish-bath building, and an oriel window in the general style of Louis XIV, rather out of the architect's habitual manner of design, but admirable and very characteristic in its drawing. Mr. Linfoot has two of his pen-drawings: one of the home buildings of a large country-house at Merion, and the other of the Miners' Hospital at Hazleton. It is to be regretted that the plan of this hospital is not shown, for in a hospital, of all buildings, the plan is the most important thing. Messrs. Cope & Stewardson have even thought it worth while to show the plans of the two country-houses of which they exhibit perspective sketches, and these plans certainly add greatly to one's interest in looking at the drawings.

Mr. Frank Miles Day has a couple of pen-sketches, one of a country-house and one of the out-buildings for it. These drawings are evidently by different hands, and suggest again the advantages often spoken of that would follow the general adoption of the system of giving credit both on the drawing and in the catalogue to the draughtsman, whether he be architect or assistant, who has actually made the sketch.

Mr. L. C. Hickman has six spirited and clever water-color drawings; five of them are designs submitted in T-Square Club competitions. Perhaps the prettiest of these is the charming design for a fountain, and the least original the "Hospital Entrance." All of them are remarkable for clean, masterly workmanship. Some other competitive designs are Mr. E. C. Kent's Renaissance city front, Mr. A. C. Muñoz's skilful, highly-finished drawing for a fountain, Mr. Clement Remington's excellent designs for a Flemish front and for a Francis I chimney-piece, and Mr. Percy Ash's attractive sketch for a drinking-fountain. Mr. Truscott has a large perspective drawing submitted in competition for the Brooklyn Soldiers' and Sailors' Monument. This is very hastily, almost carelessly, drawn in pencil, with a light wash of color over it, yet the drawing and the designing are full of spirit and very striking.

Mr. Wm. L. Baily sends half-a-dozen careful and very truthful-looking pen and pencil sketches from Switzerland, France, England and Germany, and Mr. L. C. Baker, Jr., as many water-colors from Italy. Even those who are not fond of Mr. Herzog's rather German schemes for decoration cannot fail to be impressed with the marvellous technical skill he displays in his frame of studies for wall-decorations. These drawings are pushed to the farthest possible point, and make the most striking and perhaps healthy contrast to the sketches and impressions around them. An attractive drawing, soft and without the usual forced contrasts of light and shade, is the satisfactory design for a pair of cottages by Messrs. Smith & Pritchett. By all odds the most "important" water-colors in the Exhibition are those of Mr. Nattress. They are done in an extremely English manner, finished to the highest possible point, and yet not at all muddy, as is so apt to be the case with drawings rendered in this way. Besides Mr. Nattress's interior and exterior designs for an oratory at Brompton, England, there are several other water-colors on the walls that are evidently by the same hand, although his name is not to be found on them.

Mr. George C. Mason, Jr., has an interesting group of city houses, and Mr. Mead shows two decidedly mannered but most attractive drawings of country-houses. It is useless to continue any further a description that is rapidly degenerating into a catalogue, but it may be said that, while the Exhibition, after the departure of Mr. Kirby's drawings, will have no one particular feature of interest, it is of fair average merit. As for the exhibition of paintings of which it forms a part, the readers of the daily papers can best judge for themselves, for the *Inquirer* and *Press* of the same date say of it, the one that "While the Exhibition is creditable, it is less so than on many former occasions"; and the other that it is "By all odds the most creditable and notable for many years back."



THE COLOR CHANGES IN NEW YORK BUILDINGS. — MUTATIONS OF STYLE. — HAND *vs.* MACHINE WORK. — THE LATE J. M. WELLS.

I SHOULD like to call the attention of your New York readers and such others as may happen to be in the city, to the radical change in our standards of color, as shown by some of the more notable new buildings, just completed or in process of erection. I refer to the *Times* Building and the Union Trust Company's Building, by Mr. Post, and more particularly to the *Judge* Building, the new hotel for the Goelets' on the corner of 32d Street and Broadway and the new Madison-Square-Garden Building, by McKim, Mead & White.

These buildings and many others, enough certainly to prove a changed tendency of style, are decidedly light in color, almost gay in their pearly grey stone and pale cream-colored brick and terra-cotta.

One need not be very old to remember the first awakening of our architectural and decorative impulses, through the precepts and example of Sir Charles Eastlake. Before that, all was barren for generations until one got back to the Colonial, excepting, perhaps, some features of the Greek revival, not the French Néo-Grec of 1865 to 1870, but the English impulse which belonged, I think in the forties. Eastlake, the style, I mean, was a popular revolt against the prevailing deadness and dreariness, but almost before it was born there were a few choice spirits, with us and in England, who felt it to be but a transition and a palliative, and the influence of Ruskin, Norman Shaw, Morris and the pre-Raphaelites overlaid the more popular prophet of constructive sincerity, and the perceptions of the choicer spirits soon brought in the style that was popularly christened Queen Anne. We are too near, yet, to good Queen Anne to be able to determine its value as a style, or even to explain what was really meant by the term. My own impression is that it means Norman Shaw, with certain Japanese influences and a renewed interest in our own colonial work all blended in a potpourri, more or less successful according to the degree of skill of the perpetrator.

It is easy enough to poke fun at the Queen Anne cottage or palace, but it is true, nevertheless, that we then learned for the first time to study and appreciate our own colonial houses and the more picturesque features of the English and Flemish Renaissance. From this point we have separated and individualized our work, always studying, always drawing from the past some deeper and truer lesson.

Mr. Richardson's earliest work was Gothic, his later work showed the predominating influence of the French Romanesque with certain features of decidedly Spanish tendency, and to my mind the Romanesque or Norman, whatever you may call it, the style that prevailed between the fall of the Roman Empire and the development of the Gothic, pointed-arched style, has the fascination of a period that seems never to have been worked out to its legitimate conclusions, it was stopped short, switched-off as it were into other lines by the discovery of new and attractive principles, more in key probably with the mediæval social fabric. One feels in the Romanesque more than in any other style the consciousness of being able to add to it something entirely new and yet be consequent and logical and to a great degree in keeping with our modern requirements. Other men, hardly of another generation, but still younger men than Mr. Richardson, with greater advantages perhaps of travel and certainly helped on by the clearing away of rubbish that he and others as notable of his age and generation have accomplished, have shown strong and almost exclusive leanings towards the purer Renaissance as a source of their inspiration. What the outcome of it all will be, we can as well leave to be settled by the generations to come, that the outlook is most hopeful, no one I think can doubt, and all we need to do is to earnestly strive to do the best we can.

The point I wish particularly to call attention to, is that the revolution in our ideas of color to which I alluded, is to be attributed to the growing influence upon the minds of our architects, of the purest and best work of the Renaissance, and I do not consider that the fact that all the buildings I have mentioned are not Renaissance, — some as a matter-of-fact are English Norman — invalidates my inference. The influences immediately preceding, call them Queen Anne or what you will, were all in favor of broken or tertiary colors, dull greens predominating, and "pale blacks" as a bright lady of my acquaintance once called the color of her cottage.

Now the Renaissance was essentially optimistic, cheerful, gay in all its conceptions, and contrasted markedly with the ages preceding that were mystic and sombre, and full of weirdness and dim religious obscurities. Is not after all the Renaissance much more in keeping with our civilization of to-day which is sanguine and self-satisfied to an extraordinary degree, convinced of its own advance beyond the achievements of any preceding age and unwilling to turn to any one or anything for precept or example? Is it not much more in keeping with our own social conditions, with the steam-engine, the telegraph, and the electric-light, to choose the brightest and the gayest effects that Nature will afford us and starting with cream color and gold, touch them up where they need accent with vermilion and emerald green? And if this color-scheme is the one that best expresses us, and our times, why not accept it frankly and make the most of it; we have gained from our study of the past and from the refining influences of wider knowledge and broader sympathies, a power of distinguishing shades of color and shades of meaning, that were perceived and felt perhaps by past civilizations, but that have never before our time been so well understood and analysed. Our aim is not to reconstitute any past epoch, but to take from that period the best, as we see it, and adapt it and refine it to our needs. We realize that in a restricted sense, there is nothing new under the sun, and are apt to be pretty severe upon those whose only claim to our attention is novelty, not that we are not eager for the novelty, if we could get it, but that we doubt the possibility of any new principle in art, whilst admitting it in science. We are, therefore, not likely to go far astray, for the keener the perceptions and the more able the individual practitioner of our art, the more likely he is to feel the restrictions imposed by the best efforts of preceding workers in the same field.

I go back, therefore, to the point from which I started and call attention to the latest work done and being done here as likely to

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mark an epoch in our historical development and one that has great promise of advance in the right direction.

I noticed in the last *American Architect* but one, the report of a meeting in Boston, of the National Brick Makers' Association, in which the speaker reported speaks of the demand on the part of the architects for the accidental and imperfect results of the brick makers' processes, and which ends with the speaker's saying, "So I expect to get double price for my accidents after this."

There is an element of truth underlying the remarks of Mr. Fiske, the speaker in question, but Mr. Fiske misses the mark when he treats the matter, as he does, in *quasi* jocose fashion, and shrugs his shoulders metaphorically, as though there were no use trying to account for the vagaries of unbalanced and unreasonable creatures who happen to be architects, and advises his hearers to humor them because, after all, they have power in disposing of paying contracts, and because their vagaries, though ordinarily worthless, can be charged at double price. The architect is waging a constant and never-ending war against the lifeless product of the machine. He knows better than his client, and much better than the manufacturer, how much any given piece of work gains by being *hand* made, and how much in addition to that is added to most works of art by the softening and poetizing influences of time and partial decay. It is natural, therefore, for every architect of delicate appreciation to try to discount so far as he can the lack of those agencies which made the work of the past charming and effective. The architect does not want a particular brick because it is an accident, but because the accident has to that extent destroyed the dull and purely mechanical perfection of the machine. The architects, the best at least, will insist on perfection in essential qualities and on freedom in nonessentials. The machine and the unthinking drone will strive for purely mechanical perfection throughout, and the architects will be grateful to those manufacturers, whether of brick or of lamp-shades, who will help them to attain their object — an article perfectly adapted to its practical use, but free from purely machine or reasonless perfections, and having, rarest quality of all, a bit of human individuality woven into its composition if possible.

I cannot close my letter without a few words of reference to the loss we have sustained in the sudden and unexpected death of Mr. Joseph M. Wells. He was not widely known even among the architects and other artists here, although he was an enthusiastic and appreciative musician, as well as a lover of all that was highest and best in art in all its forms. He was almost painfully diffident with strangers or those whose perceptions he felt might jar with his, and his contempt for anything that rang false was absolute and insurmountable. To those, however, who enjoyed his friendship, confidence and esteem, he was a most charming companion and a never-failing source of sympathy and inspiration. To see a man of his exceptional ability, devoted as he was, to the exclusion of all sordid motives, to the highest ideals of his profession, must have been a stimulus of the best sort to the younger men who came within the range of his influence, as it was consoling and fortifying to those more of his own age to meet him and rise with him to the higher planes, whose existence we all recognize, but which grow dim and unreal in the struggle for existence but for the power of the few exceptional ones on whom the cares of every day have *less* hold, and the devotion to the ideal *more*.

THE BOSTON BUILDING LAWS.

"All the Modern Improvements." — No. I.

AN attempt is to be made to amend the building laws for the city of Boston. It is understood that the Mayor has appointed a commission consisting of Mr. William Minot, Jr., the well-known real-estate owner; Mr. William H. Sayward, Secretary of the Master Builders' Association, and Mr. Stearns, of Peabody & Stearns, to consider the matter. The last day for the introduction of new business in the State-house, however, was February 5, and certain gentlemen interested in the matter, fearing that the above-named commission might not get their report ready in time, took the matter up, and at their request Representative John H. McDonough, of Boston, introduced an order which was referred to the Committee on Cities, covering the following points:

To amend the law so as to make the language more definite and precise, and more readily understood by builders; by clearing up all doubts as to the interpretation of the several sections; by limiting still further the height of buildings; by limiting the floor-space of warehouses and mercantile buildings; by prohibiting the constructional use of iron and steel in warehouses and mercantile buildings unless encased in brick or other similar materials, and by defining what is meant by "incombustible materials." Also to provide for the encouragement of the use of deep brick piers instead of iron columns for the outside walls of buildings; by restricting the number and dimensions of openings in external and partition walls; by increasing the thickness of foundations and of external party and partition walls; by restricting the extension and use of party-walls; by limiting the use of tar and gravel roofs; by providing that plaster or other suitable material shall be placed between the floor-boards of floors built of joists and boards in the common manner; by prohibiting or restricting the use of wooden furring on masonry walls; by specifying the requisites for methods of construction not referred to in the law; by increasing the extra thickness required in the case of raising old walls; by restricting the use of soft and light or light hard bricks, and by otherwise providing greater security to inmates, adjoining owners and the public generally against fire, decay and falling walls.

The above order is comprehensive enough to cover every possible suggestion that can be made, and it is understood to have been drawn with that end in view; so that no meritorious proposition submitted at the recommendation of the commission, or of private individuals, or of the Inspector of Buildings, should fail of consideration by the committee by reason of not having been submitted to the Legislature in season. The composition of the committee is a guaranty of judicious action.

We think there is a general feeling that the law should be amended so as to make its provisions clearer, and to remove the many ambiguities which architects and lawyers have found in the Act of 1885, and to provide more effective machinery for the enforcement of its various provisions. The amount of money at the command of the Inspector's department is totally inadequate to insure either a thorough inspection of buildings or a general enforcement of the law; and although the department has been active, particularly in the matter of fire-escapes, and the deputy inspectors do everything that can be expected of them, still innumerable violations of the law go undetected and unpunished.

Besides these changes there is a disposition to regulate the height and floor-space and material of buildings with a view to prevent such disastrous conflagrations as we have lately witnessed.

The public generally will await the action of the Mayor's commission with interest; and it is to be hoped that the members of it will, before reporting, consult not only with builders, owners and architects, but also with those whose special business it is to wrestle in the courts with the legal meaning and effect of the various clauses of our building law.

BUILDING LAW.

OLD MATERIALS IN CASES OF REPAIRS.

Question. In case of alterations, more or less extensive, where no special provision is made, can the contractor rightfully absorb, under the ægis of custom, the old material which he tears down?

Answer. We can safely assert that no custom of the kind suggested would be recognized by a court of law. The whole question would turn upon the actual terms of the contract. If the contract provides for the removal of the old material to some particular spot, or doing anything else with it which would recognize by implication the continuance of the owner's property in it, there would be little doubt that the contractor would not be permitted to claim the material as his own. If, on the other hand, the contract simply specified that the contractor should take down and remove from the premises the old material, we are inclined to think that the necessary implication would be that the material was to be his. The contract, like others, would be construed with the aid of surrounding circumstances and of all additional and collateral facts and agreements which could shed any light upon the problem; but we think that, in the absence of provisions in the contract, or facts outside it indicating a continuance of the owner's rights, the courts would construe the contract as giving to the contractor the property in the material taken away.

In other words, the custom above referred to is in no sense a legal custom, but is simply the necessary meaning of a contract of removal where there is nothing to show that the owner was to retain the property in the material.

A case has arisen in Philadelphia, in the Department of Public Works, where a contractor who had undertaken to remove an old building claimed to include the sidewalk surrounding the structure, and one of his employés who had started to remove the slabs was arrested for larceny. The questions in this case are whether the contract in question included the sidewalk, and then whether there was anything to show that the contractor was to keep the material for the city.

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ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

INTERIORS FOR HOUSE AT MALDEN, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.

[Gelatine Print issued only with the International and Imperial Editions.]

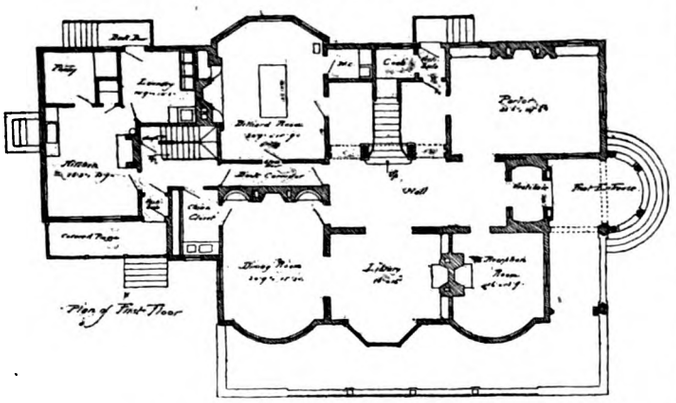
COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MR. B. G. GOODHUE, ARCHITECT, NEW YORK, N. Y.

[Issued only with the International and Imperial Editions.]

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MESSRS. CRAM & WENTWORTH, ARCHITECTS, BOSTON, MASS.

[Issued only with the International and Imperial Editions.]

HOUSE AT MALDEN, MASS. MESSRS. CHAMBERLIN & WHIDDEN, ARCHITECTS, BOSTON, MASS.



HIGH SCHOOL BUILDING, LOS ANGELES, CAL. MESSRS. N. PRESTON & SON, LOS ANGELES, CAL.

ROCHESTER ARCHITECTURAL SKETCH CLUB COMPETITIVE DESIGNS FOR RAILROAD-STATIONS.

HOUSE FOR CAPTAIN JESSE FREEMAN, BROOKLINE, MASS. MR. WARREN A. RODMAN, ARCHITECT, BOSTON, MASS.

DESIGN FOR ALICIA SPRINGS HOTEL, PENNFIELD, PA. MR. EBER CULVER, ARCHITECT, WILLIAMSPORT, PA.

THIS hotel which measures 114′ x 201′, enclosing an open court 36′ x 99′, is intended to accommodate 200 guests. The 9-foot basement contains besides the cellars a bar-room, bowling-alley, laundry, store-rooms, etc. The first story 12′ high, contains the public rooms and offices. Approximate cost $75,000.

TOWN-HALL, EAST PROVIDENCE, R. I. MESSRS. WM. R. WALKER & SON, ARCHITECTS.

THIS building, now nearing completion, has been erected at an expense of about $50,000. The first story is of body brick, with brownstone trimmings, resting on an underpinning of cut granite. The second story is framed and covered with California red-wood shingles and the roof slated with Brownville black slate. The interior is finished in cherry and the walls and ceilings are decorated in water-color. The large hall on second floor finishes up into the roof showing the framework and construction thereof.

[Additional Illustrations in the International Edition.]

RESIDENCE OF THE VICEROY IN FORMER TIMES, SANTIAGO, CHILI.

[Gelatine Print.]

CONGRESS HALL AND CHAMBER OF DEPUTIES, SANTIAGO, CHILI.

[Gelatine Print.]

CAWDOR CASTLE, NAIRN, SCOTLAND.[1]

"IT is a matter curious, and not in itself unpleasing, that the principal places noted in the great tragedy of Macbeth should still present two remarkable baronial edifices — the huge, tall, isolated pile of Glammis, and the grim keep of Cawdor, surrounded by its rambling, irregular, half-fortified outworks. Their true association, however, is more with the days of Shakspeare than those of Macbeth. Perhaps some part of the great tower of Glammis may be as old as the thirteenth century, but no portion of Cawdor is older than the fifteenth; and though its threatening draw-bridge, its vaults, and its dark corridors, may aptly associate themselves with the 'I have done the deed; — didst thou not hear a noise?' yet the time when they were built was more distant from the days of Macbeth on one side, than from those of Queen Victoria on the other. Indeed, had we an actual building of Macbeth's day in Scotland, it would not be invested with so much tragic gloom, nor could it so appropriately associate itself with deeds of horror; for it would probably be made of wicker-ware or slight timber, and be in all respects unfit to represent the proper stage-properties of a tyrant's stronghold, and the scene of a royal murder. Yet not many years ago scepticism was put to utter shame at Cawdor, by being shown the identical four-posted bed in which the murder was committed, of a fashion so old that no respectable upholsterer of the nineteenth century, even in Inverness or Forres, would have tamely submitted to the scandal of having constructed it. The room, and the bed within it, were both burned by an accidental fire in the year 1815; but it is somewhat contrary to the usual course of such traditional identifications, that a mere accident should deprive the visitor, especially the native of London, of so very interesting an exhibition; and it may be hoped that the noble owner of the castle may yet restore the room where Duncan was murdered, and fit it up appropriately with a few tattered tartans, and a broadsword or two, from the decayed accoutrements of a Highland regiment.

"Cawdor has, however, apart from its purely nominal association with Macbeth, some little mysteries of its own. In one of the dungeons stands a hawthorn tree, stretching from the floor to the roof, — an instance of the durability of that stubborn shrub, since the castle must have been built over it. So eccentric a circumstance of course elicited a tradition to account for it, which may be best described in the words of Mr. Carruthers of Inverness: —

"'The Thane who founded the castle is said to have consulted a seer as to the site of his intended building. The wise man counselled him to load an ass with the iron chest full of the gold he had amassed to erect his castle with, and to build it wherever the ass should first halt. The ass stopped at the *third* hawthorn tree. The advice was followed; the castle was built around the tree, enclosing the precious stem; and here it still remains, many a generation having pledged to the toast of "Freshness to the Hawthorn tree of Cawdor Castle." The *donjon* is about ten feet in height, and the tree reaches to the top. There is no doubt that the walls must have been built around it. An old iron chest lies beside the tree, which is said to have borne the precious burden of gold. Two other ancient hawthorn trees grew within a few score yards, in a line with the castle — one in the garden, which fell about forty years since, and the other at the entrance to the castle, which was blown down after a gradual decay, in 1836. Some suckers are now springing from the venerable root, and are carefully enclosed by a wooden fence.'

"From the same picturesque pen, we quote the following description of part of the interior of the castle, supposed to have been built soon after the commencement of the sixteenth century, venturing on no antiquarian commentary of our own:

"'In one of the apartments of this new erection is a carved stone chimney-piece, containing the family arms, and several grotesque figures, — among which are a cat playing the fiddle, a monkey blowing a horn, a mermaid playing the harp, a huntsman with hounds pursuing a hare, etc. One of these rude representations is that of *a fox smoking a tobacco-pipe*. On the stone is engraved the date 1510, at which time that wing of the castle, as we have mentioned, was erected. Now it is generally believed that tobacco was first introduced into this country by Sir Walter Raleigh, about the year 1585; and it is singular to find the common short tobacco-pipe thus represented on a stone bearing date 1510. There can be no mistake as to the date, or the nature of the representation. The fox holds the "fragrant tube" in his mouth, exactly as it is held by its human admirers; and the instrument is such as may be seen every day with those who patronize the "cutty pipe."'"[2]

ENTRANCE TO CAWDOR CASTLE, NAIRN, SCOTLAND.[1]

THE HALL, HOLCOMBE, CHATHAM, ENG. MR. JOHN BELCHER, ARCHITECT.

THE HALL, HOLCOMBE, CHATHAM, ENG., SOUTHWEST VIEW. MR. JOHN BELCHER, ARCHITECT.

THE RAILWAY TAVERN, GRIMSBY, ENG. MR. FAREBROTHER, F. R. I. B. A., ARCHITECT.

THESE buildings, which are approaching completion, are near to the M. S. & L. Railway and the Docks Station, and occupy a prominent corner site at the junction of Cleethorpe Road with Railway Street, and provide every accommodation for a modern family

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," [1845] by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

[2] Carruthers' Highland Note-Book, p. 154.

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and commercial hotel. The materials employed are red stock bricks, with Ancaster and blue Idle stone dressings and strings, the roofs being covered with green Westmoreland slates.

CLEE PARK HOTEL, GRIMSBY, ENG. MR. E. W. FAREBROTHER, F. R. I. B. A., ARCHITECT.

THIS building, which has commanding frontages to Cleethorpe Road and Park Street, is being erected by Messrs. J. M. Thompson & Sons, contractors, Louth, and contains every modern improvement in arrangement and fittings. The materials employed are thin red stock bricks, Ancaster and Idle stone dressings and strings. The corner turret forms a ventilation shaft, and is covered with copper, and the roofs with green Westmoreland slates. In addition to the hotel a hostler's house and commodious stabling are provided.

BUSINESS PREMISES, HOLLOWAY, LONDON, ENG. MR. FREDERICK WALLEN, ARCHITECT.

THESE buildings occupy the site of Nos. 368, 370 and 372 Holloway Road, and 2 Tollington Road, with land at the rear. The corner shop is occupied by a jeweller, and the remainder of the premises for the business of a confectioner and a restaurant, dining-rooms, etc. There is on the first floor a banqueting-hall, extending the height of two stories, about 40 feet long by 30 feet wide, covered in one span, and lighted by two ranges of traceried windows, with a lofty dado and gallery of oak and pitch-pine. Over this at the rear is a bakery and pastry-making room, but the principal bakery is in the three-story building at the rear, not shown in the view, in which also the electric-light engines are placed. All the most modern appliances, including ovens and heating apparatus, for the business are in course of erection. The buildings are fireproof. The facings are in red brick and Doulton stone, with some mosaic-work introduced, the shop-front pilasters being in glazed faïence. The total cost, including electric-lighting, ovens, heating, etc., will be about £20,000.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

ELECTRIC RAILWAYS.

ST. JOSEPH, MO., February 6, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — Referring to a clipping from the *Electrical Review* published in your issue of January 25, and purporting to be a list of electric railways now in operation in this country, I beg to state that the compiler thereof must have been singularly ill-informed as he makes no mention whatever of this city — St. Joseph — which was one of the pioneers in the introduction of this means of transportation. The omission is the more remarkable from the fact that more miles are in operation here than in any city named in the list, there being five lines with a total mileage of 34½ and employing about 100 cars.

As the article did not emanate from you, it is not encumbent upon you to note the correction; but I thought proper to lay the information before you. Very respectfully,

JOHN I. MCDONALD.

THE CLERK-OF-THE-WORKS.

CHICAGO, ILL., February 5, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — I am glad to take time to answer the request made in your last issue for opinions on the subject of "Clerk-of-the-Works," for I believe this to be the most important question which is now receiving the consideration of our profession. There is a growing opinion among owners of buildings, as well as architects, that, as a general rule, buildings do not receive as much superintendence as they ought to have. On the part of the architects, it will be fair to state that a building usually receives all the superintendence that the owner pays for. This brings us to two questions: First, Is it worth while for the owner to pay for more superintendence than is usually given? Second, In what manner shall the additional superintendence, if any, be given? I have noticed a disposition among those who erect important buildings in this city to secure an extra amount of superintendence, for which they are willing to pay. In one case which came under my observation, the architect was paid an extra sum above the usual five per cent for giving a large share of his personal attention to a certain building. In another instance, the owner paid a large sum to a superintendent who had had special experience in the kind of building which he was erecting.

This subject has been brought to my attention recently by the proposition of an owner to employ a superintendent to give his whole time to one building. This set me to thinking whether it would be advisable to have a clerk-of-the-works who should be paid by the owner independently of the architect's commission, and, therefore, who would be less completely under the control of the architect than if the superintendence was all included as a part of the architect's work. My conclusion in the matter was that the employment of a separate clerk-of-the-works would be very unwise. If such a man looks to the owner rather than to the architect for his pay, it would be very natural that he should take pains to show the owner that he is earning his salary; therefore, he would call the attention of the owner to all defects he could discover in the architect's plans, and say: "If it had not been for me, these mistakes would have been carried out in the building." In this way a clerk-of-the-works could cause unjust blame to be attached to the architect. There are often details of construction or design which are purposely left to the superintendent, because they can be settled at the building better than on the drawings. The superintendent who goes from the architect's office understands this, and sees that the work is carried out in a proper manner. A clerk-of-the-works who is paid independently by the owner cannot be completely under the control of the architect, whatever stipulations may be made in the agreement to the contrary, and he will be placed in a position to misrepresent the architect's plans if he has personal ends to gain by so doing. For this and other reasons, I am convinced that the best policy is for architects to increase their charges to a sum sufficient to cover all the superintendence a building may need. If an architect receives five per cent for a $10,000 house, the one and one-half per cent which is expected to cover the superintendence will not pay the salary for a special superintendent for that building; but if the building is to cost $200,000, the architect can well afford out of his commissions to pay the salary of a superintendent who shall give special attention to that building, and give his whole time at such periods in the construction as require constant supervision. Cheaper buildings do not require such constant supervision, and in many cases the owners cannot afford to pay for it, however desirable it might be. If additional superintendence is needed for a small building, the architect should ask an increased compensation for it.

It is not an uncommon question for an owner (usually one who is about to build a small dwelling) to say: "Now, when you superintend, how often do you propose to visit my house — once a day?" This sort of a proposition is usually so alarming that I fall back upon the code of the Institute, and point out to the ambitious owner the clause that says: "The supervision or superintendence of an architect (as distinguished from the continuous personal superintendence which can be secured from the employment of a clerk-of-the-works) means such inspection by the architect or his deputy, etc."

I have never found this explanation very satisfactory to the owner or to myself. After persuading an owner that it is for his interest that the architect should superintend his building, it does not give a good impression to begin immediately to explain that this does not mean that we are to visit the building very often, but only in a very general way look after the progress of the work. It would be much more satisfactory to say to the owner: "If you pay us our regular commission, we will give your building all the superintendence it requires, and you need give yourself no anxiety concerning the execution of the work; the number of visits will depend upon the importance of the work and its particular stage of progress, but we give in each case all the supervision the nature of the work demands.

In reference to the contract between owner and architect, there is as much reason for reducing this to writing as with the contract between the owner and the builder. If we took as great pains in drawing up an agreement between ourselves and our client as we do in making the contracts between our clients and the various contractors, we would avoid almost entirely the misunderstandings and consequent law-suits that are a damage to our profession. An official form of contract between architect and owner would be of great value, for the reason that many an owner who would object to signing certain agreements if presented to him as peculiar to one office would not hesitate to sign the same agreements when told that it was the form endorsed by the American Institute of Architects and adopted by the leading members of the profession.

Respectfully, NORMAND S. PATTON.

TO FIND THE NEUTRAL AXIS.

MONTCLAIR, N. J., February 3, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — I am trying to study "*Safe Building*" from your paper. I have got a problem now that brings me to a stop. It is this: In the enclosed figure it gives the "neutral axis" *L G*, but I do not know how to find it. If you or Mr. L. D. C. Berg will explain, you will greatly help a lad of sixteen. STUDENT.

[On page 7 of "*Safe Building*," Vol. I, will be found the rule for obtaining the neutral axis of any figure. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

AN AMERICAN ELEVATOR IN STOCKHOLM.— One of the most prominent objects of interest in the city of Stockholm is a passenger-elevator constructed on American principles, by a Brooklyn firm, and designed to raise passengers from a square in the centre of the city to the level

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of an elevated section of the place, known as the Stadsgarden. The enterprise, which was opened to the public in March, 1883, was the device of Captain K. Lindmart. The ground required was given by the city, which also guaranteed that no one except the municipality should be allowed to construct a similar structure within a distance of 500 feet. The right was reserved to purchase the elevator with all its machinery, at the end of twenty years, for a sum not exceeding the cost of construction. The machinery for the elevator was constructed on the hydro-pneumatic system invented by George Johnson and was supplied by Weeks & Halsey, of Brooklyn. The total height of the lift is 115 feet, the greatest speed is 2.5 feet per second, and the time occupied for the whole ascent forty-five seconds. There are two cages capable of containing eleven passengers beside the conductor. The greatest number of passengers recorded has been 11,000 in a day of fifteen working hours. The cages are driven by two steel wire cables working independently of each other and are balanced by counter-weights in the elevator tower. The cables are .7 inches in diameter and contain six strands; each strand has eight wires grouped around a central strand, composed of four wires 1 mm. in diameter. The breaking weight of each cable is at least eleven tons. A cable lasts from fourteen to sixteen months. The machinery consists of a double air-compresser driven by a double-cylinder non-condensing steam-engine. The diameter of the steam cylinders and of the compresser is one foot; the stroke is fourteen inches. The steam-pressure is about sixty pounds per square inch. The consumption of coal has averaged less than a ton per day of fifteen working hours. The level footway from the top of the elevator tower is 498 feet long. It is constructed of lattice girders, and has four spans, the largest of which extends over houses and measures 275 feet. The total weight of ironwork in the footway is 212 tons. The weight of passengers was computed at seventy-five pounds per square foot, and the coefficient of safety was taken at five. The maximum wind-pressure was reckoned at thirty-one pounds per square foot of vertical surface, but twice that amount of strain was allowed for. Everything seems to have been conducted with an ample margin for safety, for the records of the Meteorological Institute at Stockholm show no wind-pressures in excess of eighteen pounds per square foot, and only 500 persons are allowed upon the footway at a time, although there is room for five times that number. The cost of the whole undertaking was 9956 pounds sterling and the working expenses for the year 1885 were 1816 pounds sterling. The traffic that year amounted to 1,667,000 or 4570 per day. — *Providence Journal.*

A Mysterious Count and his Machine.— The visit of a certain French Count to London has given us much to think of beyond the limits of the disease, both mental and bodily, by which we have been assailed. This Count P. — who, strange to say, seeks no publicity — is one of the most learned men of the century His studies have been followed in participation with the experiments of the great experimentalist, the late Ruhmkorff. The latter was generous enough to own that it was under the direction of Count P. that he accomplished most of his greatest inventions. The wondrous reel invented by the Count is still considered the most marvellous conquest of science. Upon this reel is wound a length of silver wire measuring 75,000 metres. Two magnetic needles crossing each other in a contrary direction are fixed upon the reel, and suspended by a slender thread. The apparatus works under glass like a watch, so that no tampering with the mechanism is possible. It is mounted, moreover, on a high stand. The Count takes hold of the two conductors, to which are attached the two ends of the silver thread rolled upon the reel, and bids you order the machine to move to right or left, according to your will. Under this power alone, hitherto misunderstood or underrated — this, the mightiest power in the universe, according to Count P., the power of the human will — the machine will act without the contact of touch. To right or to left will the reel revolve according to the fancy of the visitor. Without speech, without touch, by the mere mental influence alone, will the machine move in obedience to the unexpressed command. But not in all cases does the machine answer unreservedly. It is to the powerful will alone — the concentrated and fixed determination — that it can be made to reply. Ruhmkorff used to laugh immoderately at the vacillating movement of Count P.'s machine when the savants of the Académie were induced to try the experiment. With some the wire would tremble and vibrate, then start to one side, then move towards the other; while with others it would refuse to move at all, but confine its trembling vibration to one spot. The experiments made by Count P. in London have all been exhibited strictly in private. His object in coming here is merely to obtain wire more finely spun than any he has hitherto been able to get in Paris. They say that, contrary to the general rule, the Count, from having been all his life a confirmed materialist, has been converted to the highest degree of religious faith, to conviction of the lofty destinies of man and his connection with the divinity; man has abused his gifts and delivered himself to evil, but the divine essence is still within him. So fearful has the philosopher been of the pursuit of the fashionable coteries who under pretext of scientific inquiry merely seek to derive amusement from the most serious experiments in science, that he has sought a retreat in a convent near London, and his excuse of being compelled to return thither by eight o'clock is made to reply to all invitations to dinner, or to "select parties," or to "small-and-earlies" with which the fine ladies of London would seek to overwhelm him.— *Birmingham Post's London Correspondence.*

A New Yucatan Exploring Expedition.— An important scientific exploration is to be made of the less known parts of Yucatan and Mexico, regions which have not hitherto been scientifically explored, except so far as archæology is concerned. It is the object of the expedition to ascertain, as a continuation of former explorations in Florida, the general structure of the basin of the Gulf of Mexico, concerning which there is much diversity of opinion among scientists. The exploration will comprise, besides the geological examination of the region, a close examination of ts zoology and botany, towards which end specialists in various departments of science will accompany the expedition. The exploring party will be under the leadership of Prof. Angelo Heilprin, of the Academy of Natural Sciences, and will devote special attention to geology and paleontology. The expedition will leave New York by steamer on the 15th instant, stopping first at Progreso, Yucatan, whence the research will extend into the interior of that State. The expedition is organized under the auspices of the Academy of Natural Sciences, which has received the coöperation of its individual members, and also of the American Philosophical Society. — *New York Evening Post.*

TRADE SURVEYS

A summary of the new commercial, manufacturing and building enterprises announced since the opening of the year, so far as it has been possible to make it, shows that the increase in activity over the month of January last year amounts to from 10 to 15 per cent. Fuller reports, were they available, might increase or decrease this approximation; but it is evident that the business interests of this country have started in under a stronger head of steam, so to speak, than last year; no doubt the possibilities of a reaction or depression are kept in view by all. The advancing cost of raw material has not been deemed a sufficient cause for restricted activity. In fact, the improving prices have rather stimulated than retarded new work. Buyers of all kinds of raw material are still placing contracts for future delivery. This statement is made upon the authority of those competent to speak on such a matter among iron-makers, lumber manufacturers, machinery-makers, and the manufacturers of all kinds of equipments and supplies. The testimony of the jobbing interests in our larger cities, while not so strong, is yet of the same character, viz., that the country is preparing for a heavier production and consumption. The New York jobbing interests report a very heavy and steady distribution of all lines of goods handled. The orders for the fall trade, usually placed about this period, are fully as heavy as they ever have been. Distributors are rather anxious to place their orders, especially when assured that the prices named are to be the prices paid. Manufacturers in nearly all lines are entering into heavy and long engagements for products at fixed prices. They are pursuing this policy in the face of this danger, viz., that should an extraordinary demand set in two or three months later, the prices of all kinds of crude and finished products would presumably advance. These interests are protecting themselves against such a catastrophe by the above-mentioned policy of placing their orders for raw material now, and under such conditions as will insure their execution. An enumeration of the new enterprises of sufficient magnitude for specific notice would be quite interesting reading. Among these new enterprises are one, and possibly two, well-equipped ship-yards, three large rolling-mills. several blast-furnaces, projected bridge-work, involving an immense amount of capital safely to be estimated anywhere between twelve and fifteen million dollars, projected elevated railroad-work roughly estimated by engineers at twenty million dollars. The purpose of referring to these few lines of projected work is to emphasize the probability of an advance in certain kinds of raw material. Builders, whose judgment it is safe to rely upon, have very recently made contracts for supplies to carry them several months ahead in view of this very fact. At the same time, this possible advance in prices may not occur, and for the reason that never in our history were so extraordinary efforts being made to increase the supply of material of all kinds for construction work. Producers are quick to adapt themselves to most unexpected requirements.

The makers of machinery, especially, are being crowded with work as they never were. Machinery for making machinery is wanted upon a very large scale. A few years ago, a 1,000-horse-power Corliss engine was the wonder of the world; the other day an engine-builder received an order for an engine of 3,500 horse-power. The rush for machinery, big and little, has not only stimulated the demand for the necessary raw material, but it has resulted in the projection of many new machinery-making establishments. This extraordinary prosperity rests upon a stronger foundation because like conditions prevail in foreign countries. The character of this improvement can be best observed by reference to iron and steel prices abroad. Steel rails have advanced in England within a year from a little under four pounds to seven pounds per ton; iron plates, from five and a half pounds to eight; steel plates, from six and a fourth pounds to nine; steam-coal has advanced from six and a quarter shillings to twelve shillings; blast-furnace coke from twelve shillings to thirty shillings. The foreign ship-builders have under contract all the work they can do for six months. Such a rapid advance may not be a permanent one, but there will be no return to the extremely low prices of former years. On the Continent a corresponding advance has taken place. and the advance is likely to prove a permanent one, for the reason that both government and private requirements have suddenly grown to unusual proportions. Prices on this side have also advanced, but within narrower limits. American manufacturers are now questioning the possibility of the permanence even of the ten to twenty per cent improvement that has been made. The point which the now vast producing interests on both continents have to keep in mind is, to control their expansion. Markets cannot suddenly absorb increasing outputs. A healthy trade is the result of a number of agencies and conditions. The extent of our railway system and the cheapness of travel are a strong protection against those disasters which have left their mark upon our industrial history. From twenty to fifty years ago, people could not move freely or cheaply from place to place; the slightest depression or overcrowding of one industry or one market is the signal for a scattering of the surplus humanity, energy and capital, and the railroads automatically tap the evil and precipitate the unemployed surplus where it will find employment and create new markets. This is a question which banking interests have studied with more care and acuteness than the manufacturing or smaller business interests. The careful study of this problem has led these heavier and farther-seeing interests into schemes for the development of newer sections of country, which are now employing a great deal of capital. The inevitable expansion of land values in these new sections is one of these foreseen things. In years past, the bulk of railroad investments were made for immediate returns. There is more light now spread upon the science of investments, and capitalists are now measuring their investments by ten or twenty year possibilities. For this reason, the business interests of the country are less susceptible to ups and downs. Far-off results are now kept in view.

S. J. Parkhill & Co., Printers, Boston.

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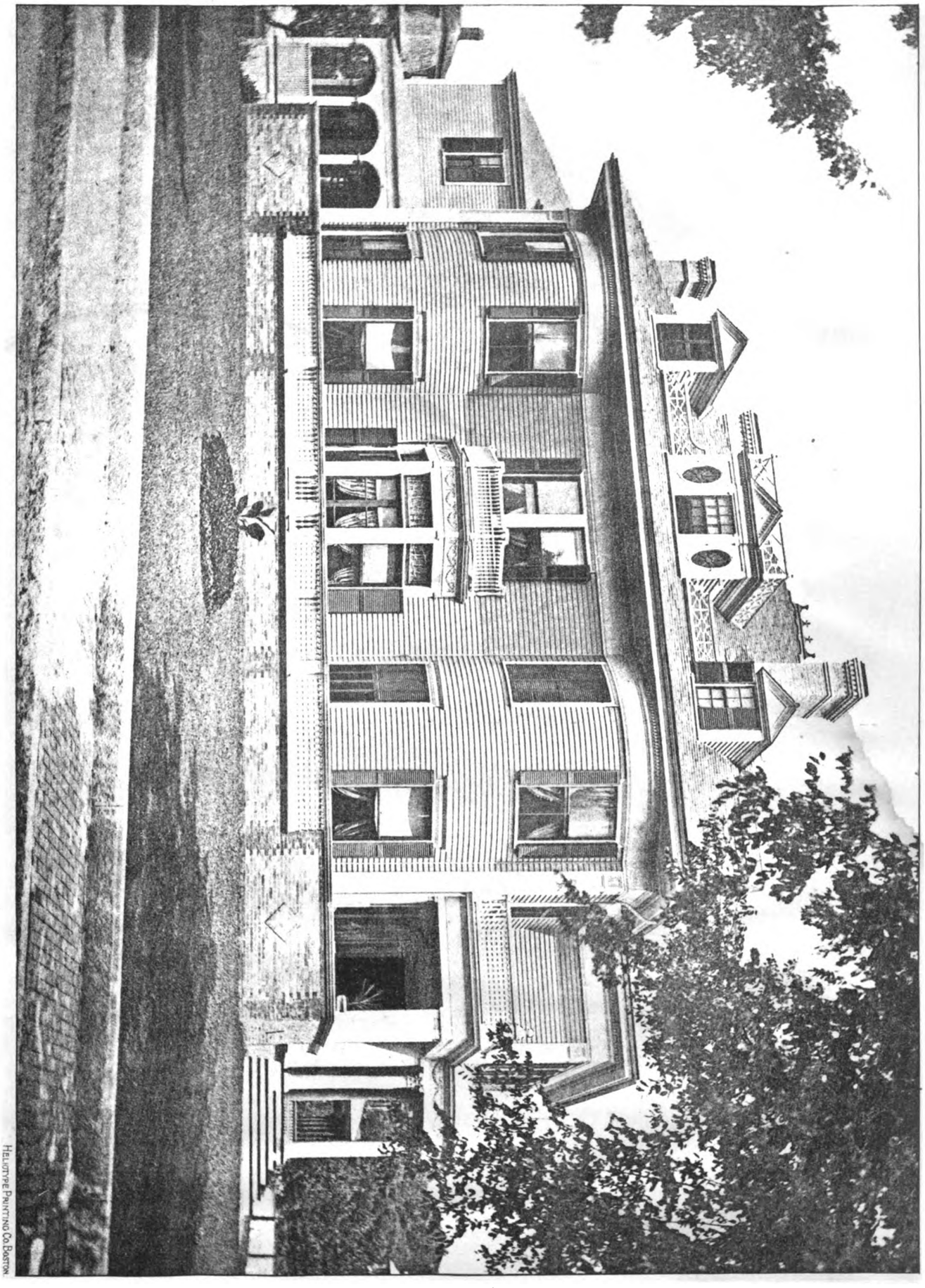

HOUSE AT MALDEN, MASS. CHAMBERLIN & WHIDDEN, ARCH'TS.

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ACCEPTED: DESIGN :: J: N: PRESTON & SON: ARCHITECTS: LOS: ANGELES: :

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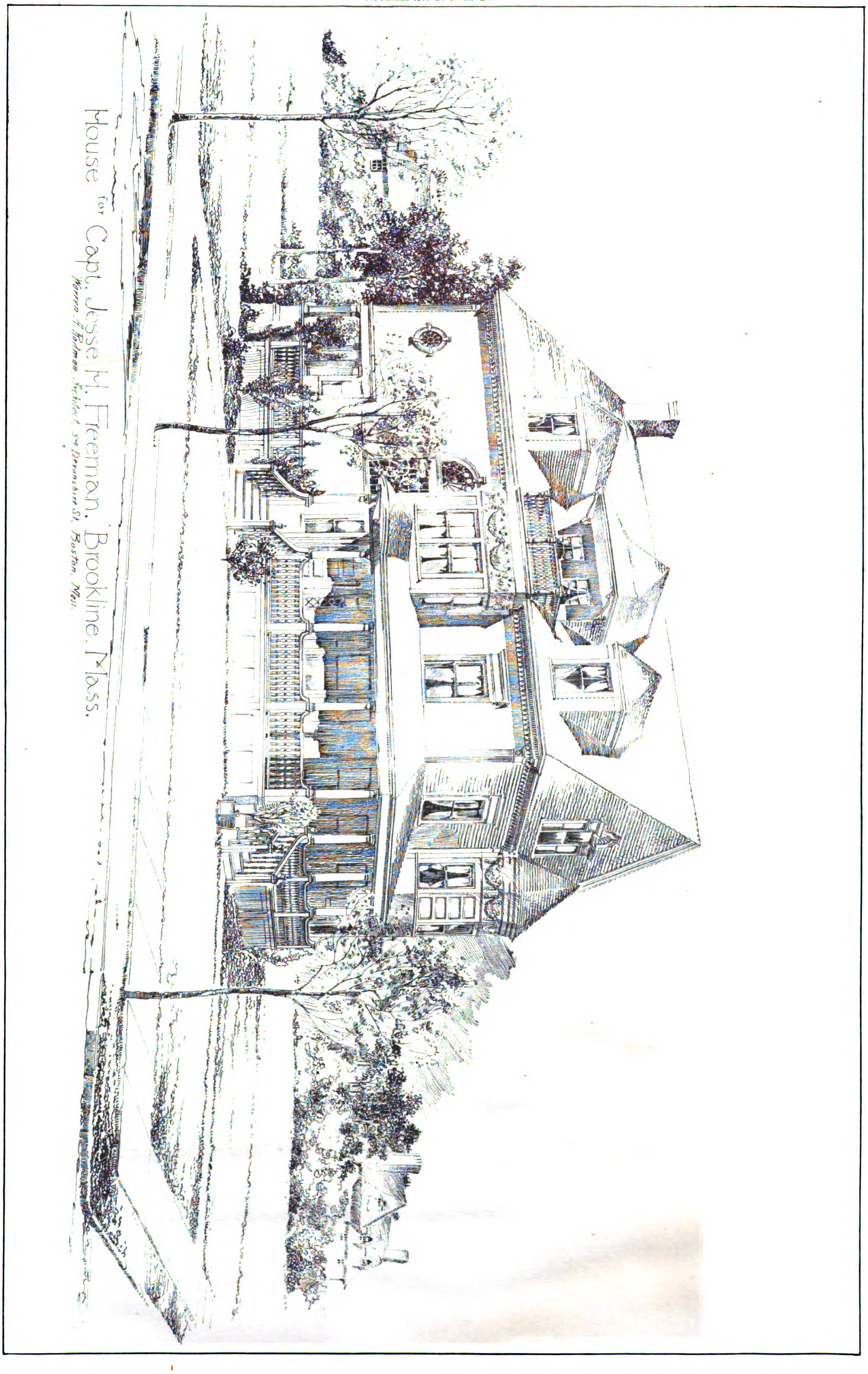

House for Capt. Jesse M. Freeman, Brookline, Mass.

Wm. H. Coleman, Architect, 59 Devonshire St., Boston, Mass.

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ALICIA SPRINGS HOTEL AT PENNFIELD PA.

E. CULVER ARCH'T. WM'SPORT PA.

FIRST FLOOR PLAN.

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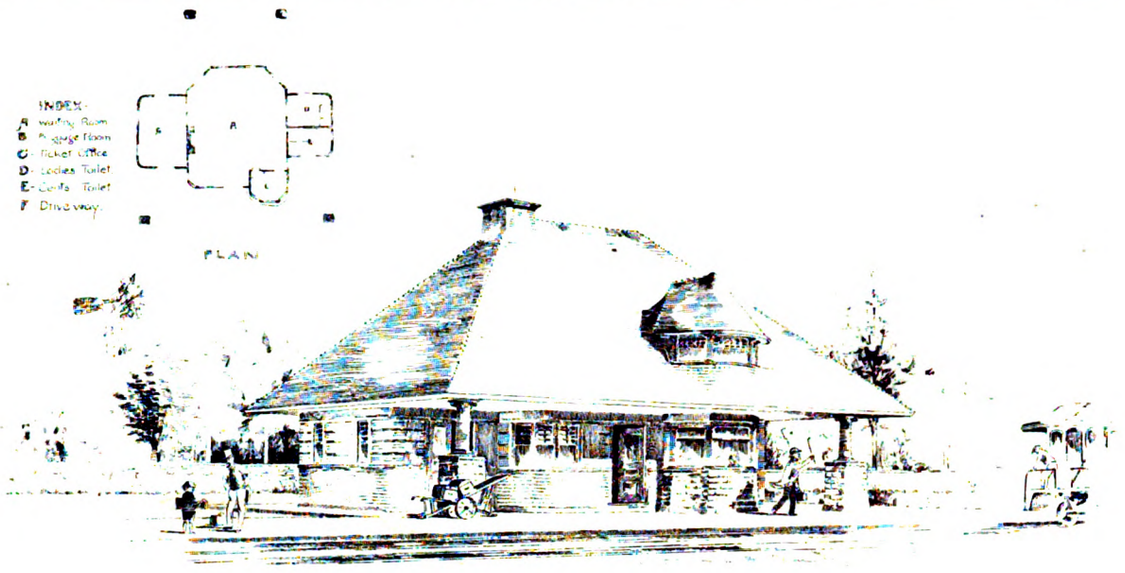
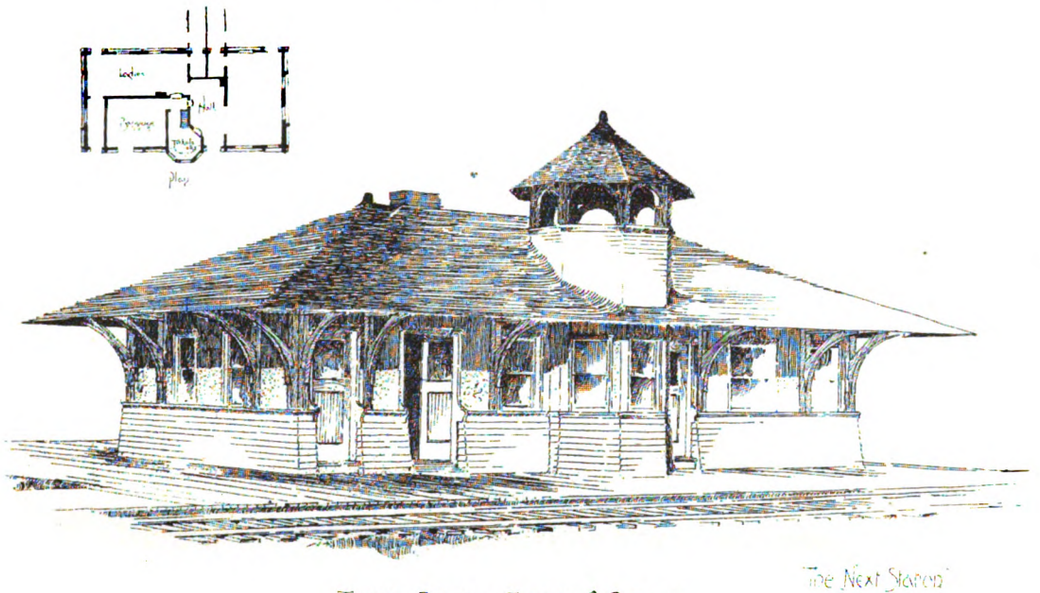
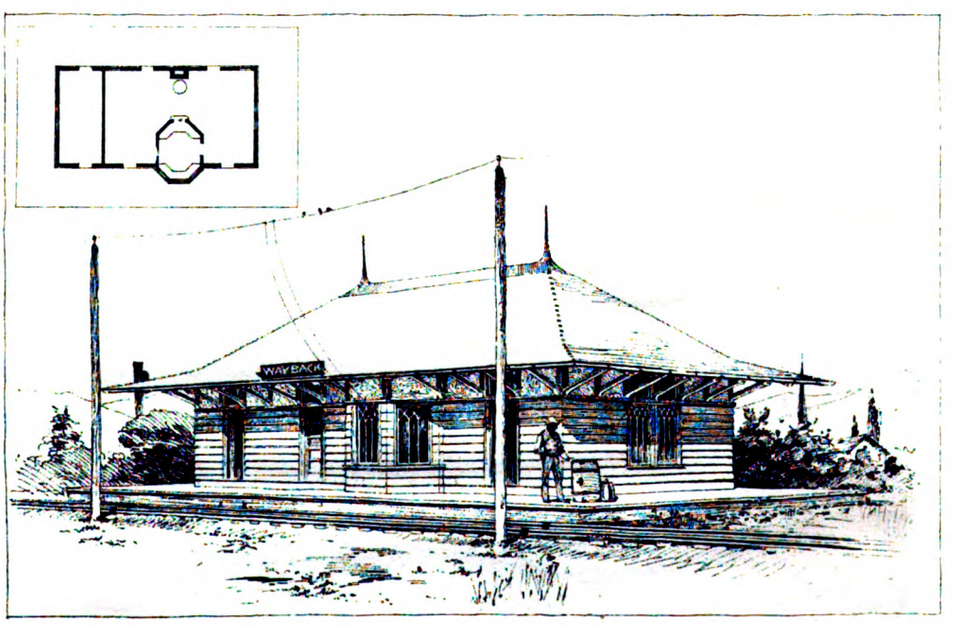


First Prize ~ W. H Barnes



Third Prize ~ Edwin S. Gordon.



Second Prize ~ C F Bragdon.

A. S. C. Competition.

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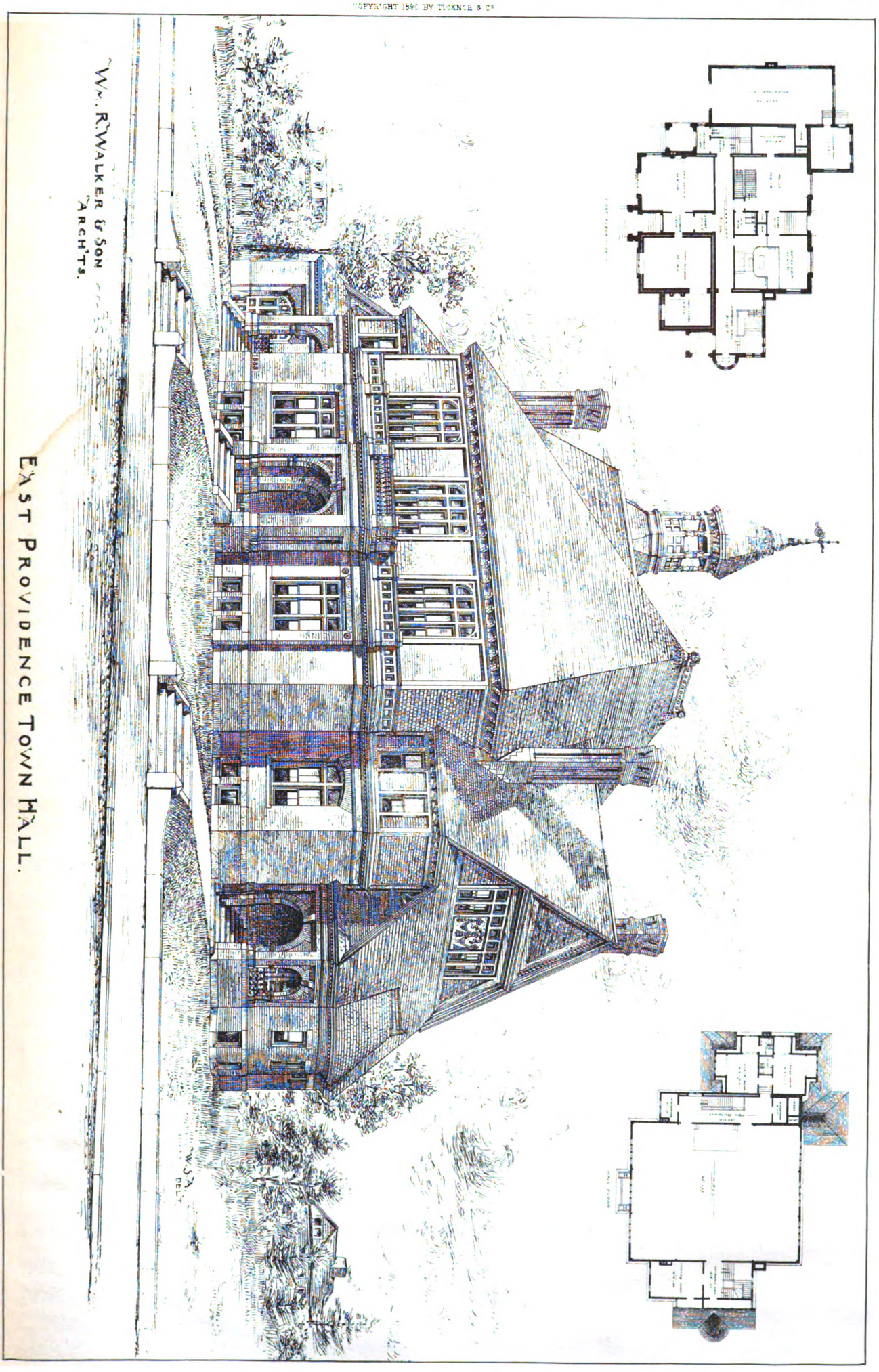

EAST PROVIDENCE TOWN HALL.

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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FEBRUARY 22, 1890.

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THE people of Rhode Island have had enough of their new lien law, to which reference has been made in these columns, and a bill is now before the Legislature to modify it. Under the present statute, material-men, as well as mechanics, have an almost unlimited privilege of lien against buildings, and the consequence is that the banks refuse to lend money for building purposes, unless they are secured by the pledge of other property, less liable to be dishonestly taken away from its owner than improved real estate; and, as the people who wish to build small houses can rarely give a large amount of collateral security to strengthen their mortgage-notes, they are obliged to go without their houses, or wait until they can pay for them in cash. The new bill proposes that the material-men shall be required to give three days' notice to the owner of their intention to hold him responsible, and that the owner may in that case refuse to receive the goods; but this does not go half far enough. The simple fact is that material-men have no just right or claim whatever to any kind of lien, and ought never to be allowed to have one, and that in the States where they have succeeded in getting the public authority to pull money by force out of the pockets of innocent persons, to make up losses due to their carelessness and unbusiness-like habits, the result has been to encourage all sorts of shiftlessness and rascality in matters connected with building, and to drive honest contractors out of business. Logically, all lien laws are wrong, as they give an unjust advantage to one class of men over another class; but those for the benefit of mechanics are supposed to be excused by the fact that if a journeyman does not get his wages from his employer, he must extort them by force from some one else, or starve. In practice, it would tend greatly to the cultivation of prudence and foresight in workingmen, and to the suppression of rascally contractors, to have journeymen in the building trades obliged to collect their pay from their debtors just as other people do, but wise Legislatures have decreed that, if they find any difficulty in getting their employers to pay them, they can help themselves to the value of their wages out of the property entrusted to them, and a good-natured public endures the injustice. With material-men the case is entirely different. There is no fear that their children will die of want if they trust a dishonest contractor occasionally, and there is no more reason for licensing them to fall upon an innocent owner, and extort the amount of their bad debts from him, than there would be for issuing letters-of-marque to doctors, authorizing them to chloroform their rich patients, and extract from their pocket-books the amount of all their claims against other persons which it was too much trouble to collect in the ordinary way.

MR. EDOUARD SIDEL, of Birmingham, Alabama, died in Paris recently, of consumption, at the early age of thirty-one. Mr. Sidel was born in Paris, and studied with distinction at the Ecole des Beaux-Arts. After leaving the school, he travelled for a year or more, sketching and accumulating useful observations, and, at the end of that time, decided to try his fortune in America, rather than at home. He came first to New York, where he easily found employment, and went thence to New Orleans, but finally settled in Birmingham, soon gaining a large business there. Nearly a year ago his health failed, and he returned to France for rest and change, but grew rapidly worse, and died in his own home in Paris, on Christmas day. Mr. Sidel was a thoroughly accomplished architect, as well as a man of great force of character, and possessed, to a degree very unusual among the French, the capacity for assimilating himself to circumstances about him. He was much interested in American architecture and architects, writing to us on several occasions on matters of professional importance; and, shortly before his departure from this country, he joined the American Institute of Architects as an Associate.

THE *Engineering and Building Record* tells a story about concrete which has the disadvantage of being true. The Brooklyn, Bath and West End Railway Company is, it appears, attempting to build a station in Brooklyn. Owing to the conformation of the ground, the foundation of a portion of the station serves also as a retaining-wall for a high bank, and was laid out seven feet thick at the bottom, two feet thick at the top, and thirty feet high. Earth was filled-in behind it as fast as the masonry was carried up. We do not learn whether the earth-filling extended to the top of the wall, but, if so, the wall, if a long one, was certainly too thin to hold a loose earth-filling. However, the wall was better than the foundation. This was ostensibly of concrete, but the "concrete," in practice, consisted of cement, sand and stone, dumped *dry* from a height into the trenches, the theory of the builder being that, as the earth around the trenches was damp, the moisture from it would gradually penetrate the mingled cement and other substances, and make them into concrete, in the same way, we suppose, that a cook steams raisins and dough into a plum-pudding. It is needless to say that the result did not confirm this convenient theory, and the wall, which seems to have had its choice whether to bulge from inherent weakness or settle from defective foundation, concluded to do both, and, on the occasion of a heavy rain, which came on after the masonry was completed, it settled in one place and bulged in another, and fell down completely in a third.

IT is astonishing to observe how ignorant and careless nearly all masons are with cement and concrete. Even the best masons hardly ever think of paying any attention to the quality of the cement they use. So long as it is dark-colored, and stains the mortar so as to satisfy the eye of the architect, it seems to make no difference with them whether it consists of inert loam or strong cement-stone, and it is almost invariably left to the architect to test and reject it. The consequence is that, where the brand of cement required is not specified by name, and, indeed, often where it is, some perfectly worthless cement is almost always first sent to the job, where it is industriously used until the architect sees the barrels, or tries a sample, and sends the whole lot off, whereupon it is transported to some other job, to be again detected and ordered off. We remember a batch of cement, consisting of fifteen or twenty barrels, which attended us, as the Old Man of the Sea did Sindbad, for about a year. It first appeared on some foundation work, and was immediately sent back to the dealers who furnished it. When the brickwork of the building was begun, under a new contractor, it was sent again, and was again promptly rejected. Its third appearance was on the ground at another building, from which it was forthwith ordered away.

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Shortly afterward, the plasterer at the first building needed some cement, and the familiar, shabby barrels were delivered a fourth time for his use, to be a fourth time discarded by the architect's order. A few days elapsed, and, for the fifth time, the same miserable stuff, apparently in the same barrels, was delivered at a third building, to be used in some repairs. Now, we need not point out that such persistent attempts by dealers to palm off worthless cement greatly injures the business of the manufacturers of better cements. It is too much to expect architects to test new brands of cement, and, finding that they are sure to have trouble if they allow the builders any discretion, through the indisposition of the latter to take any pains to find out what they are getting, quite as much as through the dishonesty of the dealers, they are obliged to have recourse to the system of specifying that one of two or three brands with which they are familiar shall be used, and sending off all barrels marked with any other brand. They know that they may be doing a sort of injustice to a worthy manufacturer in rejecting barrels simply because the brand is not according to the specification, but after the work is begun it is usually too late to test the cement to be used in it, and, as experience has shown them that cement furnished by dealers which varies in name from the specified brand is almost always bad, they have no alternative but to presume the worst.

AFTER the cement is on the ground, it is seldom used by builders with any discretion, particularly in the case of concrete. We have heard of a contractor who made concrete by filling his trenches with sand and gravel, and then emptying the required number of barrels of Portland cement on top, and "washing it in" with a hose; and few masons make a much better mixture. The idea that the sand and pebbles, or broken stone, must be absolutely separated, the sand and cement first thoroughly mixed, dry, until no streaks can be detected in the smooth surface made by drawing a spade over it; and that, after carefully moistening this mixture, and turning it, the pebbles, washed, are to be finally added, never seems to occur to them, and, even if the proper method is precisely specified, the specification is generally disregarded as a architect's whim, and the cement is half-mixed with a pile of unscreened sand and gravel, and then "drowned" with a furious stream from a hose, and dumped into the trenches, forming ultimately a mass having hardly any of the properties of concrete. Wretched stuff as it is, however, when occasion arises it is clothed by the mason's imagination with qualities little short of magical. We once saw a building on piles, which had settled very badly, being "underpinned" with concrete. The masons had dug a trench beside the foundation wall to be underpinned, not extending down to the footing of the wall, and were putting in what they called concrete in the trench. To our inquiry how the so-called concrete was going to assist in holding up the wall, they replied that it was expected to "adhere" to the outside of the stonework, and prevent it from settling any further!

L'EMULATION contains a curious little piece of architectural history, relating to the erection of the Cathedral of Mons, one of the best pieces of late Gothic in Belgium. Several different architects have had the credit of designing it, but M. J. Hubert has collected a great number of items from the expense accounts in the archives of the Cathedral, showing conclusively that the original architect, under whom the work was begun, in 1450, and who continued in charge of it until his death, in 1457, when the choir was well advanced toward completion, was Jean Spiskin, probably a citizen of Mons, as he is not described as coming from outside, and is, moreover, mentioned later as having taken a journey, at the expense of the Cathedral Chapter, to examine the churches at Tournai, Lille, Louvain and other places. The canons of the Cathedral, which was probably originally a convent church, like the English cathedrals, were ladies, apparently of very high rank, and perfectly ignorant of practical affairs, but prudent enough to ask for plenty of the best advice, and liberal enough to pay for it. Their first step, after they had determined to replace their old Romanesque church by one in the style now at the height of its popularity, was to send to Brussels, and invite the canons of various other cathedrals, who happened to be visiting there, to come to Mons and assist in their deliberations; and, at the same time, a certain number of master-masons and carpenters, noted in the country for their skill, were called to meet the assembled ecclesiastics.

THE accounts show that Jean Huwellin, a master-mason, of Hainault, Michel De Rains, also a master-mason, of Valenciennes, Jean Le Fèvre, master-mason, of Mons, and probably others, were in attendance on Saturday, Sunday, Monday, Tuesday and Wednesday, March 1 to 5, 1449, "to give advice about commencing to lay out and put into form" the intended work; and each was paid twenty sols for his trouble, besides his expenses, and the cost of taking care of his horse; De Rains, who appears not to have owned a horse, being allowed twenty-five sols extra to cover the expense of hiring one, while a further sum of four livres Tournois was paid him for "having placed and compassed upon parchment two patterns of the manner of the work which, in his opinion, it would be best to carry out on the site of the said treasury and choir." What may have gone on subsequently between De Rains and other manufacturers of "patterns" does not appear, but on the thirty-first of January, 1450, Maitre Jean Spiskin, placing his hands, in feudal style, between those of Jean Leleu, as the representative of the canonesses, took an oath as "master-workman, having the charge of the works which should be done on the said church." His salary was fixed at forty livres Tournois per year, with cloth for "grande livrée," and the use of a house belonging to the Chapter, and near the new building. What might have been the character of an architect's livery in those days, it would be curious to know. It appears, at least, to have been something a good deal better than that of a footman, and, in this particular case, the architect's new mistresses seem to have been very kind to him, for, in less than a week after his appointment, we find him starting off, with the carpenter, Jean Hulin, to accompany the lady canonesses to Bonne-Esperance, "to inspect the grandeur and the fashion" of the church of that place. On returning from this expedition, Spiskin, Hulin, and Henry de Jauche, who may have been the architect's assistant, were sent at the expense of the canonesses, who furnished them with hired horses for the journey, to Tournai, Lille, Grammont, Louvain and Malines, "to inspect the fashions of the churches of the said towns, and submit their observations in writing." This journey lasted nine days, and cost the ecclesiastical ladies a considerable sum.

IT may be imagined that Spiskin did not have much time, in the intervals of his travels, to finish his plans; but he had barely time to recover from the effects of his nine-days' ride on a hired horse when another council of experts was summoned, and Maître Gille Pole, a master-mason of Brabant, Maître Mathieu de Layens, a mason of Louvain, Piert Pole, Pierre des Moulins and Jean Le Fèvre, one of the original advisers, were sent for, lodged at the "ostel" of the Angel, and all their expenses paid, besides a liberal fee for their services, which consisted, this time, in examining the final drawings and specifications, and expressing their opinion about them. The canny experts, wiser than their successors of this generation, seem to have taken pains to find everything exactly as it should be, and the occasion was apparently one of great festivity; for we find that Spiskin drew a sum of money for his disbursements in "accompanying" them, and that he gave them a supper at the expense of the canonesses. On the 9th of March, 1450, the work on the ground was begun, and four days later the corner-stone of the new church was laid, with great solemnity, at twelve o'clock at "nuene," by the Demoiselles Katherine de Mastain and Jeanne de Bousies, canonesses of Cheens, assisted by two little boys, Ernoul de Trasegnies and Oste de Hoves. The rest of the day was spent in rejoicing: seventy-three sols were given to the workmen, to drink; twenty-one sols were spent in white bread, to be distributed to poor children; and Spiskin entertained, at the expense of the canonesses, "my Lord the Governor" and several others, who came to see the ceremony. A few months later, a rumor spread among the townspeople that the foundations were being badly laid, and Pole, Le Fèvre and de Layens were called in again to see if the rumor was correct. They examined the work, and reported that there was no ground for the story, and the work was then vigorously resumed. Everything then went on uninterruptedly for nearly seven years, when Spiskin died. The work continued for about a year without an architect, de Layens being only summoned from time to time from Louvain to give advice, as occasion arose. It then became evident that a more permanent arrangement was desirable, and de Layens was formally appointed architect of the church, at a salary of thirty-four livres Tournois per year, with twenty sols each way for travelling-expenses between Louvain and Mons.

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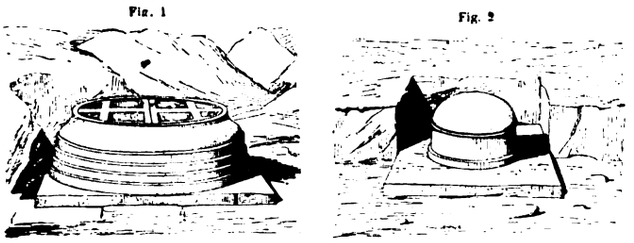
FUNERARY ARCHITECTURE.[1]—II.



Mougheir Tombs.

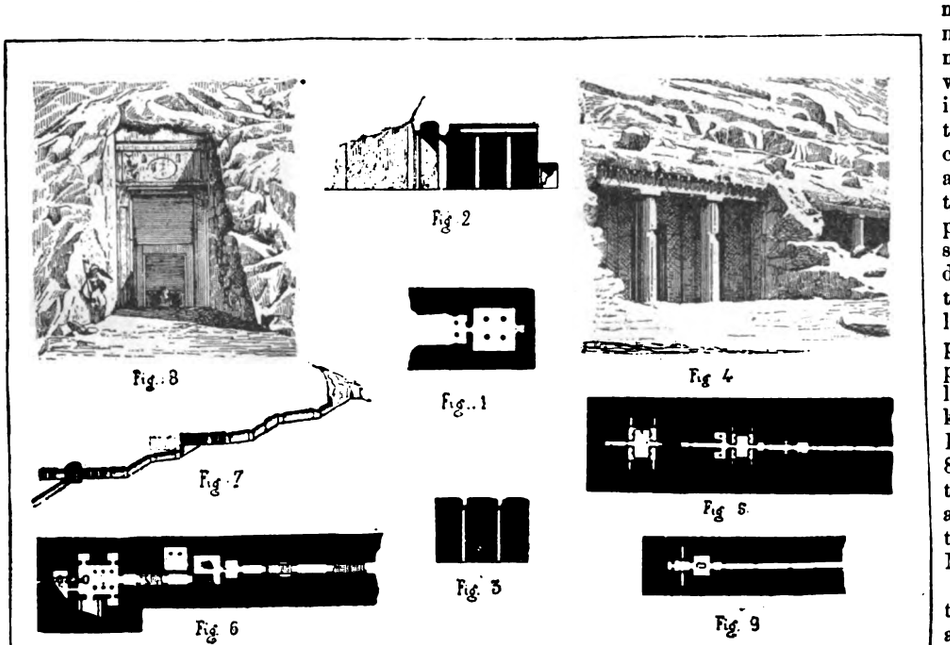
THE *mastabas* and pyramids constituted the vast majority of the Egyptian tombs of the First Memphite Empire. The *hypogea*, of which we are about to treat, were at that period little more than the exception to the rule.

During the First Theban Empire [Middle Empire], the tombs underwent scarcely any modifications, except such as the nature of the soil necessitated. Thus, in certain portions of the necropolis of Abydos, tombs are found almost identical with those of Memphis, while in other parts, where the soil did not admit of the excavation of the shaft and burial-chamber, the former was suppressed and the latter was placed above the ground, inside a small pyramid, which was quite roughly constructed of crude brick. Often, also, the chapel was replaced by a simple enclosure, which was the only accessible part of the monument.

The *hypogeum*, or subterranean tomb excavated in the side of a mountain, which was of very rare occurrence under the First Empire, came into general use. We give a typical example of these sepulchres, which is very beautiful in its bold simplicity; it is found at Beni Hassan; the illustration is borrowed from the work of Gailhabaud [*Hypogea*, Figures 1, 2, 3, 4]. The external porch, like all the rest of the tomb, is cut into the limestone; it is composed of two columns, the character and proportions of which foreshadow in a singular fashion the Greek Doric column; a heavy architrave is surmounted by a sort of larmier supported on coarse dentils. Do this sepulchre and those near it furnish us the prototype of the Greek Doric order? We scarcely think so; but we do find here a proof that the primitive peoples of the globe were forced to adopt similar forms to satisfy identical needs. From the porch we enter a chamber whose ceiling is supported by four columns, and which is lighted only by the door. A statue of the occupant stands in a niche. Many tombs belonging to this period still exist; they vary but little in general design. Sometimes there are two or three chambers or chapels decorated with paintings. In one of them, a square shaft, starting at the surface, runs to a vault dug at a lower level. This shows how deep-rooted the primitive tradition was.

Although the Theban kings of the Middle Empire continued to be buried in pyramids (yet never presenting the gigantic proportions of those of the First Empire), the *hypogeum* came into general use for private sepulture.

Under the New Theban Empire the *hypogea* were adopted by the kings themselves, and all tombs, without exception, were of that order; the royal tombs, however, alone attained the extraordinary dimensions of those known as *syringes*. There existed still a very marked distinction between private sepulchres, which continued to resemble more or less closely the type described above, and those of the monarchs, which, besides being of unusual size, possessed other striking peculiarities. In their various parts, which remained essentially the same, certain changes were wrought, necessitated at the same time by the demands of a new art and by the ever-persistent obligation to protect the body from all injury. The sepulchre proper did not change; as was the case in the pyramids, the burial-chamber was reached through an inclined passage traversing a series of halls, and not through a shaft. The long corridor was often strewn with obstructions designed to baffle intruders. The entrance to it was very narrow (Figure 8), and it was doubtless hidden as much as possible. Not the slightest trace is found, even at the entrance to the tombs, of chapels accessible for commemorative ceremonies. The Pharaohs of this period were not content with merely collecting in such underground rooms these marvellous paintings which we admire to-day, and which were endowed with a sort of magic virtue by the religious faith that they were designed to gratify; moreover, having renounced the pyramids, whose naïve simplicity no longer satisfied their artistic sense, these monarchs felt the necessity of impressing the imagination of their subjects by monuments worthy of the splendor of their reigns. We see, therefore, veritable temples taking the place of the primitive chapels at the entrance to the pyramids. As these structures must needs be of gigantic proportions, like everything else undertaken by the Pharaohs, they could not be built in the mountain-side, where tradition placed the royal tombs. They were, therefore, erected in the plain, some distance away from the real sepulchre. Separated from these, they became commemorative monuments, genuine cenotaphs, designed for the celebration of funeral rites, and containing colossal statues of the dead. The Ramesseum and the Amenophium were doubtless funeral temples. It is noticeable that the paintings with which they are ornamented, unlike those of the *hypogea*, have a very marked biographical character. As for the tomb itself, it was still constructed in the flank of the mountain; and no matter what marvels of art were brought to its adornment, the entrance was concealed, so far as possible, for the purpose of protecting it from spoilers. The dimensions of the *hypogeum*, like those of the pyramid, were in proportion to the length of the king's reign. Figures 6, 7 and 8 [Hypogea] give the plan, section and the entrance to the tomb of Menephtah I.



Hypogea.

This separation of chapel and tomb was peculiar to royal monuments. In private sepulchres the principles of the *mastaba* were always preserved.

It was only under the last Egyptian dynasties that the *hypogea* were constructed with a fore-court, the entrance to which was indicated by a pylon.

In the Delta, which was periodically inundated, the nature of the ground precluded the possibility of subterranean sepulture.

A great number of tombs are still found on Egyptian soil, notwithstanding the vicissitudes of the centuries; and one can fancy how vast the number must have been when he

[1] From the French of Pierre Benouville in Planat's "*Encyclopédie l' Architecture et de la Construction.*" Continued from No. 738, page 101.

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remembers that family tombs did not exist. Each individual desired to have a sepulchre for himself, his wife and his very young children.

ASSYRIANS AND CHALDEANS.

Assyria, for some scarcely explicable reason, shows no traces of ancient tombs. A few stelæ [Stelæ, Figures 1, 3], however,

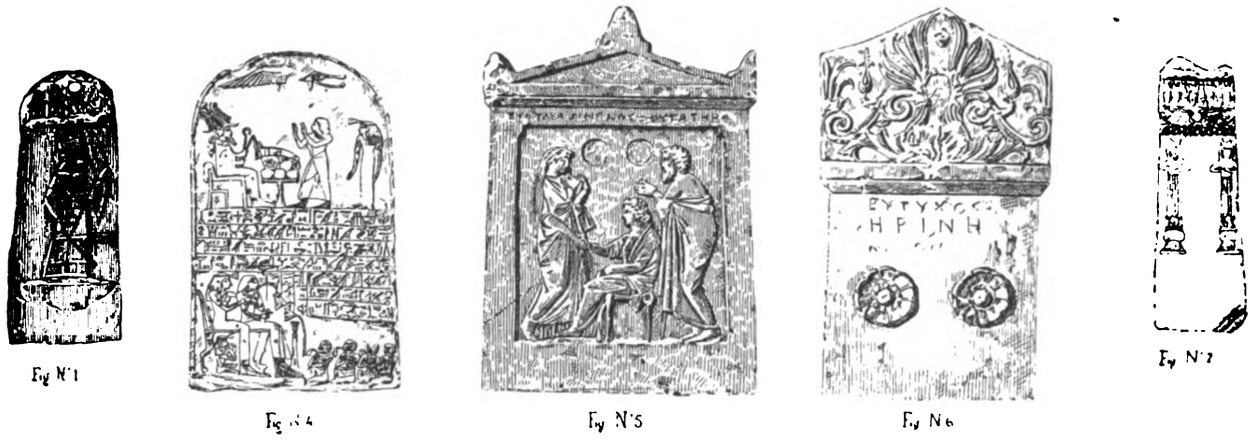
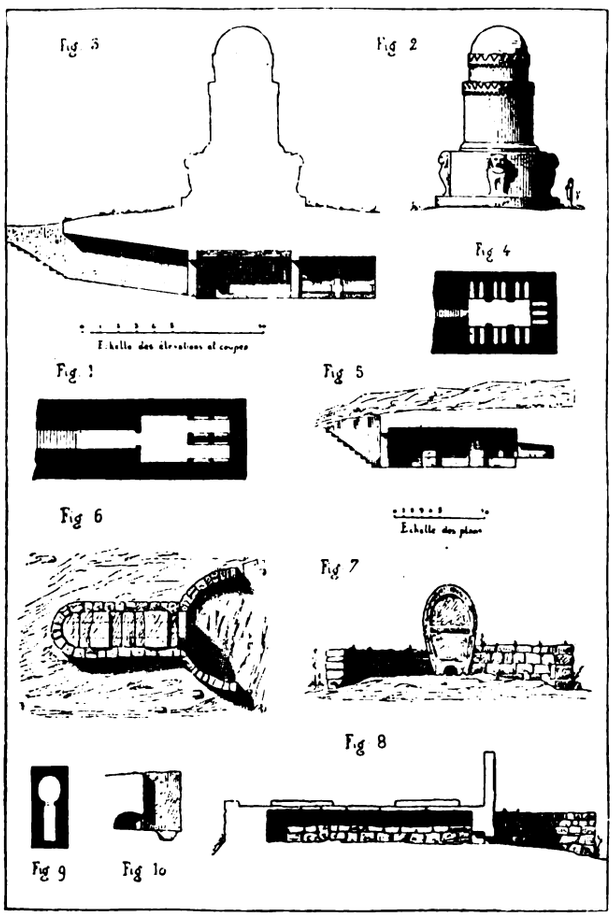


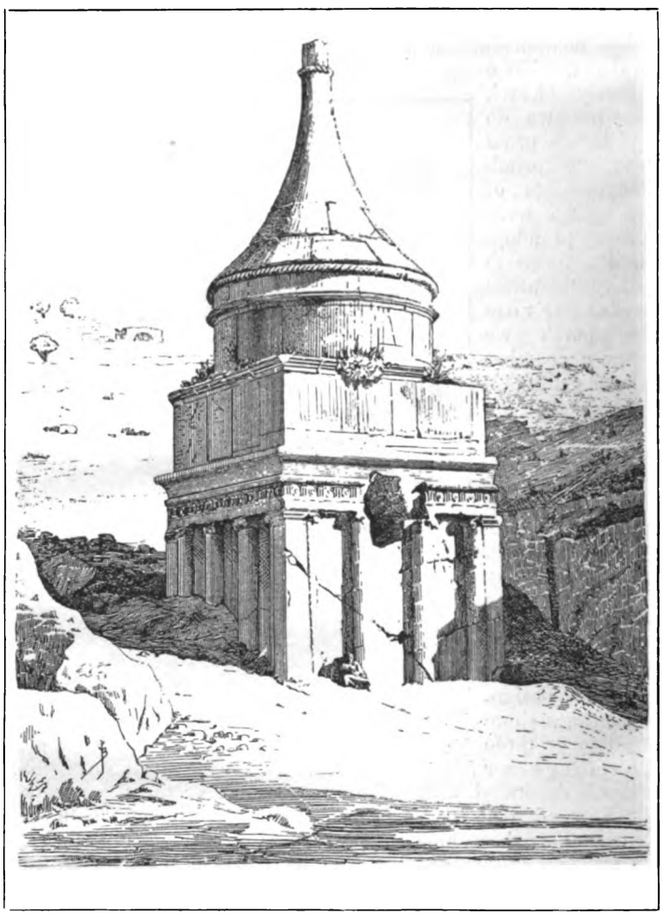
Fig N°1 Fig N°4 Fig N°5 Fig N°6 Fig N°2

Fig N°7 Fig N°8 Fig N°3 Fig N°9 Fig N°10

Various Stelæ.



Phœnician Tombs.



Absalom's Tomb.

Having given to the Egyptians the place of honor due to them as the greatest tomb-builders of the world, we will pass rapidly in review the funerary architecture of nearly all contemporary nations.

exist, which were designed for sepulchral monuments; we have good ground also for assuming that the Assyrians held very nearly the same beliefs as the Egyptians concerning the mystery of death. Certain authors have supposed that they sent their

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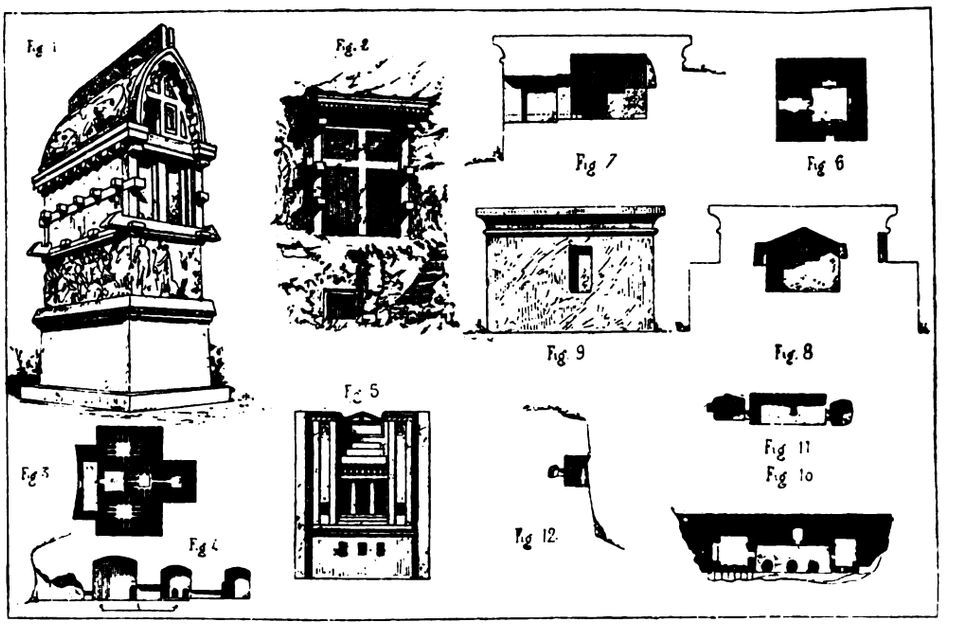
dead to Chaldea for burial as that was their native country, their holy land. The hypothesis seems all the more plausible because the level soil of Assyria was but ill-adapted to sepulchral excavations, which, as we know, constituted the burial places *par excellence* of primitive races. Moreover, recent discoveries have disclosed an accumulation of tombs in Chaldea which cannot be accounted for except by some such supposition.

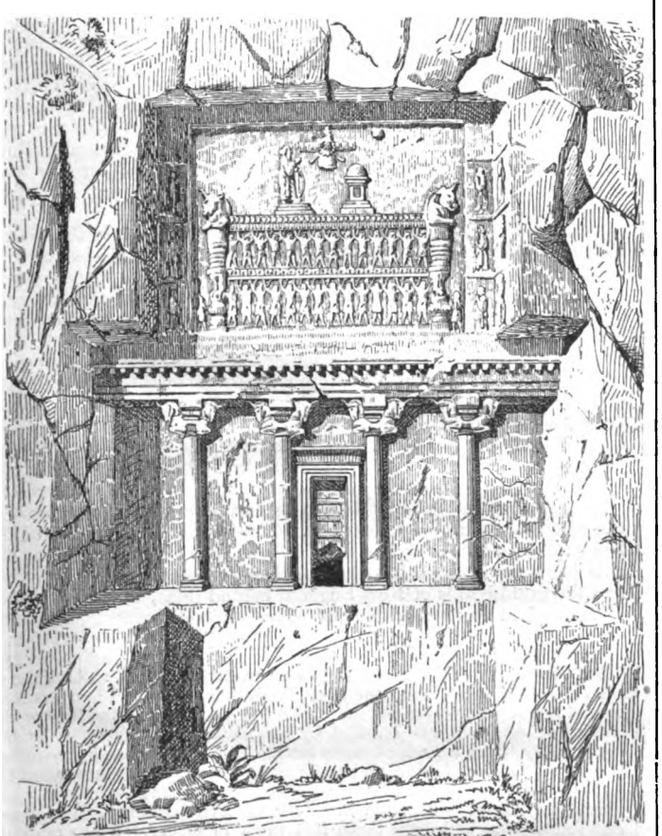
The Chaldean tombs are very peculiar, and exhibit but little architectonic character; sometimes they are mere vaults, the arch of which is formed by corbelled bricks; sometimes the bodies are simply deposited on a brick flooring and covered with a sort of lid, made of several pieces of terra-cotta joined together [Tombs of Mougheir, Figure 1]; the lid is sometimes dome-shaped and surmounts a cylindrical portion (Figure 2.) The terra-cotta was originally enamelled. These tombs, or rather graves, were piled upon each other in such fashion as to form high hillocks, the wind filling up the interstices with sand. Scarcely any examples of isolated tombs exist in Chaldea.



Tombs in Judea and Asia Minor.

PHŒNICIANS.

We give a few examples of tombs belonging to the civilization of Phœnicia, or to that of her colonies such as Malta



Tomb of Nakschi-Roustam.

[Phœnician tombs, Figures 4, 5] and Carthage (Figures 9, 10). Here again the rock excavated into a burial-chamber surmounted by an ædicula constitutes nearly all the constructional character of those monuments whose simplicity does not exclude all claim to character. The tombs found in Sardinia known as the Tombs of the Giants are more peculiar. (It appears to be clearly demonstrated now that the *nurhags* strewn all over Sardinia were not intended for sepulchres). These tombs [Phœnician tombs, Figures 6, 7, 8] contain a vault or burial-chamber built of stones without mortar and covered with slabs of stone; it is large enough to contain several bodies. In the anterior portion rises a rude stela; it occupies the centre of a hemicycle constructed like the vault. At the bottom of the stela an opening is pierced, doubtless designed for libations. In examining this singular monument one cannot but be struck with its similarity to the Celtic monuments.

JUDEA, ASIA MINOR AND SYRIA.

In these countries, likewise, it is the hewn rock that nearly always furnishes the place of entombment; whether the sepulchres be hollowed out of the rocky mass, with a more or less conspicuous façade [Tombs of Judea and Asia Minor, Figures 3, 4, 5], as in early times, or whether the detached rock is made to assume the appearance of a structure, as in the much later tomb known as the Tomb of Absalom, and in whose architecture the Greek influence is unmistakable, the same principles are always traceable in the conception and execution of the designs. The monolith of Siloam, which we reproduce from the learned work of MM. Perrot and Chipiez, is likewise a curious example. We also call attention, in the tomb excavated after the manner of a hypogeum (Figures 3, 4), to the disposition of the cells for the bodies, which are dug perpendicularly in the walls of the chambers. Our Figures 10, 11, 12, borrowed from the work of M. Guillaume, shows a Hethite tomb, which recalls, at least in the arrangement of the porch, the entrance to the Egyptian hypogea.

The Lycian sepulchral monuments (Figures 1, 2), although also cut into the rock, present a very different character. We find a curious attempt in them to reproduce the appearance of wooden constructions. One of them has the form of a genuine catafalque resting on a base which preserves the look of stone.

MEDES AND PERSIANS.

The few ancient tombs encountered in Persia are all without exception, cut into perpendicular rocks and situated at a high elevation above the ground. This manner of burial resulted from the religious beliefs of the ancient Persians, who, like the Ghebers of to-day, did not inhume their dead, but exposed them to birds of prey which soon devoured the flesh. Kings alone were entombed; but, fear of contamination from fire or earth forbade their incineration or interment. The custom was, therefore, adopted of excavating their tombs in the side of a rock, at a great height above the soil.

Tombs of this kind are to be seen at Nakschi Roustam, a

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dozen leagues from Shiraz. They antedate Alexander's invasion. The illustration which we copy from Gailhabaud permits us to dispense with a long description of this strange, colossal monument. Suffice it to say that the figure on the three steps over the bas-relief is supposed to be the image of the King holding his bow in his right hand and facing the altar on which burns the sacred fire. A singular form above, seemingly afloat in the air, is probably the *ferouher* or familiar spirit of the dead. The globe at its side represents the sun. The total height of the three divisions of the monument is about 100 feet. At the bottom of the false door is an aperture which has been enlarged by spoilers; it gives access to a vaulted room, into which open three niches containing the bodies.

The monuments dating from the period of the Sassanides dynasty are very different from the above in character, and exhibit little more than bas-reliefs sculptured on the face of the rocks.

[To be continued.]

CHICAGO

THE HAVEN SCHOOL-HOUSE AT EVANSTON. — THE BUILDINGS OF THE NORTHWESTERN UNIVERSITY; DEARBORN OBSERVATORY; MEMORIAL HALL AND SCIENCE HALL.

ALTHOUGH, of course, the largest and most extensive buildings are those erected in our city proper, still a great deal of excellent work is being done in its suburbs. Among others, Evanston, a suburb of about ten thousand inhabitants, situated on the northern shore of the Lake, is noticeable for its recent good work in this direction. One of the buildings to which its citizens point with especial pride is the new Haven School-house, which, in point of wise arrangement, if not beauty, seems to excel any other such construction in this part of the country, and has attracted wide and favorable comment from those interested in such matters. It is a two-story edifice, built of common buff brick, with white limestone trimmings, which produces a novel and not particularly artistic effect, with its entire lack of any attempt at ornamentation, excepting the cornice of brick in the shape of an arcade, surmounted by a stone coping. The ground-plan of the building, crudely expressed, is two Greek crosses with four large bays resting on the arms of each cross. Either side of these bays contains a large triple window, with a large single one on its side, these giving abundant light to each room. By this arrangement a much greater number of well-lighted rooms is attainable on each floor, and the necessity of more than two stories is avoided. The question of utility, and not beauty, is again consulted in the finishing of the grounds around the building. As no grass is ever known to grow successfully about a school-house, it has been decided best to avoid any attempt at such luxury, and the grounds are, therefore, graded to the street and covered with fine gravel. Trees in the yard are also tabooed, perhaps because they are usually so dismal a failure in such places.

Situated in Evanston, also, is the Northwestern University, a thriving institution of over seventeen hundred students. This institution has, during the last year or two, erected some very excellent buildings. The most northern of these, and one of the most successful, situated on the low bluff, where it has the Lake for a background, is the Dearborn Observatory. The treatment of this building is extremely successful and pleasing. The material is the common limestone, rock-faced, with red tile roof. The building is Romanesque in feeling and one-storied, with the exception of the observation-tower, which has two and a half stories, and which, with its red tile dome, is unusually well treated. The building is entirely without ornamental detail, with the exception of small stone finials in the shape of globes. However, the simple outline of the low, sloping roof, with the broad archway of the entrance, go to make up the outlines of a building which, taken as a whole, is unusually picturesque, as compared with other edifices of its kind.

The Garrett Memorial Hall is the next south on the campus. The building is Romanesque in style, built of red brick, with black slate roof, both brick and slate being, unfortunately, of exceedingly poor quality. The plan is a rectangle with a rounded end at its western extremity, in which is located the chapel, and on the south side, containing the entrance, rises a square tower with a loggia in the third story. The design is extremely good, and the ornamental details most carefully studied, up to the line where the roof commences. When one occasionally does see a piece of work where the style is faithfully carried out, it makes one regret that such things are not oftener done. The fault lies with the public, who often think as highly of bad work as good, and see no difference between the work of an educated architect and one who has drawn his chief inspiration from "*The Practical Joiner's and Carpenter's Assistant.*" It is considered proper to-day that a cultivated man and woman should know something of painting and sculpture, and why does not the time come when they should have an appreciative knowledge of the kindred art of architecture? If that were the case, we should have fewer of those monstrosities that raise their proud heads in the style of the Fifteenth-century Gothic till they reach the sill-course, and then with equal pride continue in a somewhat doubtful Romanesque manner, finished off, very likely, with "Queen Anne" pepper-boxes.

Partly because of its rarity, do we doubly appreciate a thoroughly good building when we see it.

At the end of the chapel of the Memorial Hall the arches for the small windows are carried on engaged columns of terra-cotta. These columns are extremely charming bits of design, and show knowledge and study. The cornice around the building is of the same material, and also very carefully worked up, having the true Romanesque spirit, but the terra-cotta finials are not at all worthy to be classed with the rest of the work, for above the cornice line, alas! the spirit seems to have departed from the designer, or, what was more probable, the work was handed over to a less skilful draughtsman, since we have here a confused mixture of Classical and Romanesque foliage, which has no style at all. The terra-cotta columns in the loggia, though of good design, are too light for the place, and give one the feeling of insecurity when the heavy weight above them is taken into consideration. The material does not seem to be suitable for this place, as the column has to be jointed, and cannot be in one piece.

As one steps across the threshold one sees the Romanesque idea is abandoned, and the mouldings, where the style might have been carried out in spite of the severe simplicity, lose all character. The only glory of the chapel is two very brilliantly-colored and harmoniously-arranged stained-glass windows. Here the Romanesque method is again felt in the use of the small, brilliantly-colored pieces of glass.

Another new building is the Science Hall. This, also, is of red brick with slate roof, the material being of much better quality, but the design much less satisfactory than the Memorial Hall. Here, where a large number of students congregate, where panics are liable to occur because of accidents in the laboratories, the heavy outside doors are carefully arranged so as to open inwards, as is often the case in our semi-public buildings, preventing any one from standing any reasonable chance of escape. This same criticism applies with equal force to the new Memorial Hall, as well as to all the old buildings of the institution. The walls of the laboratories are finished in common well-laid bricks, and whereas at first glance they give an unfinished aspect to the rooms, it must be a great advantage in the way of cleanliness. Next to the new Science Hall stands the old University Hall proper, and, although a pleasing structure in limestone of Fifteenth-century Gothic style, shows, when compared with the new buildings, how much has been gained in the matter of lower ceilings — a gain in beauty to the building on the exterior and interior, and how much gain in obviating the useless expenditure of muscular tissues the students could testify.

Many beautiful houses have been recently built in this town. Foremost among them stands one now nearing completion on the Lake shore, near the southern terminus of the Drive. Excepting in one feature, it is remarkably pure colonial in style, and from its general good taste is very agreeable. The foundation, which extends higher than the usual water-table, is of granitic boulders, which, with a large chimney of the same material, break the monotony of the light, yellow-painted wood, though there might be raised the objection that the effect is disquieting, and the rough-boulder appearance seems scarcely in harmony with the Classical feeling pervading colonial architecture. The gables are away from the street, fronting the Lake, giving the side of the gambrelled roof of dark shingles to the street, the monotony of the roof being broken by dormers. In the interior the colonial feeling is carefully preserved, although the principal rooms are finished in the natural woods. Many of the less expensive houses of this town are extremely good, as well as the new club-house, which has recently been erected, and, if they only had the granite hills of New England behind them, would have been photographed and spread far and wide.

The Resistless Power of Ice. — Some gentlemen were looking at the tons of ice piled upon the dike Wednesday, and the conversation turned upon the power of the ice during a shove. An interesting sample of ice force was recalled by one citizen — a house and family swept away "like a pack of cards brushed off a table," as he described it. The man and woman and their two or three children were in the house, which was an old French style affair. At that time there was a green bank sloping up from the river toward the house. The house had foundations and walls three feet thick in places. It was about 12 o'clock, and the family were at their dinner, when suddenly the ice commenced to move. The upper ice struck the sheet of shore ice and sent it like a huge knife up the bank, scraping all before it. Before the family had time to escape, the edge of the knife had struck the house. It cut it clean away and left not a soul alive of the entire family. Hardly one stone remained upon another, so heavy was the crash of the ice upon the house. One living thing alone escaped — the pet dog of the family. Two cakes of ice had fallen in such a manner as to form a sort of roof over the dog, and it was found unhurt. — *Montreal Witness.*

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NOTES RELATING TO CONCENTRATED RESIDENCE IN VARIOUS COUNTRIES.[1] — II.

COMFORT: —

11. *Quiet.*

It furthers quiet by the absence of corridors or open stair-wells; and by the enclosing of entrance-ways.

This differentiates this System from: — All buildings which have longitudinal or other extended public corridors or passages on each floor, or have open stair-wells; and from buildings, the dwellings in which are approached through open courts, *cités*, alleys, or slums.

In the palaces, convents, and mansions Europe and, to a less extent, in the dwellings of the more wealthy in all countries, thick walls and partitions, outer rooms and gardens, are all used in careful planning to secure a degree of quiet proportionate, if possible, to the sums expended. Whatever methods, in the planning and construction of buildings, secure the least passage of sound, and especially those of these methods that take up least space, are being, and will be more and more sought for, and used as the advantages of concentrated residence are sought by ever increasing numbers. Floors, and thin partitions, which are sound-proof, as well as weather-proof, fire-proof and vermin-proof; double windows, not only for greater warmth in winter, but to shut out external sounds at all seasons when closed, and which can be easily and quietly opened and closed, and which occupy no unnecessary space for frames, etc.; doors which cannot be slammed; door frames with sound buffers rather than unnecessary and combustible trimmings, etc., will be more and more demanded. The plans of this System, while prepared for the ordinary and long-tested methods of construction, have also been prepared with a view to adaptability to an approximately fire-proof, vermin-proof, and sound-proof construction.

12. *Allows of Elevators.*

It allows of Elevators communicating on each story, like the stairs, with two (or sometimes three) dwellings; [also of using one general Elevator for mounting to an upper floor, and thence descending, by the stairs, to any dwelling].

This differentiates this System from: — All buildings where the use of an elevator necessitates having public corridors on each floor, whereby quiet and privacy are lessened, and having dwellings with rooms facing in opposite ways, so as to command thorough-draught, is prevented.

In the Hôtel du Louvre, Grand Hôtel, and other of the large hotels in Paris, one lift or elevator gives access to vast numbers of rooms placed on each side of long corridors which lead from the elevator and principal staircase; and the same method is used in most American and many English hotels. But in apartment-houses one elevator communicates frequently with but two dwellings on a floor. In a practically rectangular building, one elevator cannot on any floor level, communicate with more than two dwellings which have through-and-through, or direct private thorough-draught; and with not more than four dwellings which have angle thorough-draught. Where a greater number of dwellings are, on any floor, in communication with a single elevator, one, or more of them must be deprived of command of thorough-draught by the corridor giving access from the elevator to the dwelling beyond.

13. *Sea-Breeze* (in New York).

It allows, in New York, the Sea-Breeze to enter every Room.

This differentiates this System from: — All rooms in New York, whether in tenements, flats, apartments, or private houses, which do not have, or do not open into rooms which have, windows facing south, or southeast, or southwest.

Summers in which a land breeze is frequent, or of long duration, are the exception in New York. The torrid sudden heats of two or three days' duration, recurring at intervals throughout the American summer, would, were it not for the buildings, and especially their grouping and interior arrangement, be in New York scarcely felt with the discomfort experienced elsewhere, even a few miles to the north, east, or west, of the city. The night is cooler in a New York room from which thorough-draught is in no way impeded, than in most country-houses. The summer climate of New York, some generations ago rivalled — and some generations hence, when the planning of cities and city-buildings for the health, comfort, convenience, and recreation of all their inhabitants, is more fully understood and carried out than now, may again be found to rival the climates of the best American watering-places, whether inland or on the sea-coast, combining, as it does, the best qualities of both in its peculiarly exhilarating air.

RECREATION; —

14. *Play-Ground.*

It provides a Play-Ground in the open air with every house, for the use, in common, for the Children of all the families residing in it.

This differentiates this System from: — All tenements, flats, apartments, or houses which provide no playing-place for the children of their occupants except the dwellings themselves, or the public halls and corridors, and stairs of approach to them, or else the public streets, or nearest public square, or open spaces.

The number of parks, gardens, promenades, ramparts, and open spaces of all kinds, in and about the principal cities of all countries, are numerous and on the increase in number, size and beauty. Yet entire freedom for children to play as they like in them, is not so common; nor would it be possible to retain the beauty of the parks if all restraint as to the uses to be made of them were removed. Again, however free, extensive or numerous such public spaces are, they are generally too far away from some, or many homes, to be of service to all families as a recreation-ground at all hours of the day and evening. The play-grounds for children proposed and provided by this System have the further advantage of being at the top of the house where the air is purest, and the noise of the players is least heard.

15. *Garden-bed.*

It gives a private Garden-bed to every family.

It differentiates this System from: — All dwellings which lack this feature.

The surrounding of the children's play-grounds with a narrow garden-bed border next to the outside of the play-ground's enclosing high railing (which can be further protected, or closed, near the bottom by wire netting or sheet zinc, if desired), and the dividing of this border into lengths corresponding to, and accessible from, the private bleaching spaces of each family, are shown on a plan published in the *American Architect and Building News*, May 5, 1888.

In looking down from a balcony or window on to a roof, or a path, from which a glare of sunshine is reflected, the relief to the eye which would be experienced if such surface were covered with foliage, like an ivy-clad, or turf-clad surface, is easily imagined. Such a surface covering or blanket of low-growing, native hardy growths, especially such as also keep green in winter, like checkerberry, wintergreen, etc., with a simple mechanical appliance for irrigation added, is suggested to deaden sun-glare from the entrance-way roof, in the plan above named.

Discomfort to the eye is so important to be avoided that other discomforts or inconveniences are often patiently borne in order to secure for a time a pleasing change of scene, or secure constantly pleasing surroundings, or outlook. The pleasantest outlook is on green foliage. In a deep foliage-clothed ravine we can scarcely see the sky, and cannot see the sea or waving fields, or mountain outlines. Many most beautiful objects are absent, yet we are pleased. Often a convent cloister, a patio, or a vine-clothed court-yard are beautiful in proportion as they give, not varied details, but the absence of unpleasant details, in their narrow enclosure. An ivied or moss-clad, or even time-softened hued wall often soothes the eye, without other detail, and indeed by its absence of detail; for the detail is absent that calls for attention without greatly rewarding it, — distracts in a word — distracts not from contemplation of the wall, but distracts from the mental contemplation of subjects that the quiet hues of the wall leave us free to contemplate, or even have by some subtle sense of harmony, helped to bring to our minds. In crowded city courts or alleys we find a certain seclusion if others cannot overlook us in our apartment; a further seclusion if we cannot overlook others, or be distracted by a sight of them or their belongings; and a further gratification if a branch of a tree in a neighboring garden is seen over a roof or wall, or even encroaches on the narrow vista commanded by our point-of-view. In seeking for foliage, suited to the New York climate and occupying little lateral space, yet which, to the dwellings on every floor, would afford in summer a glimpse of green, or even screen or clothe somewhat the exterior of adjoining dwellings, but, in winter, would not shut out sunshine from any dwellings, — the wisteria is found to combine these most desirable, as well as other very pleasing, qualities; and points at which wisteria can be advantageously planted to climb vertically, on wires, to the tops of the buildings, are marked on the above-named plans.

APPEARANCE: —

16. *First-class Approach.*

It gives a first-class Approach to every Dwelling.

This differentiates this System from: — All dwellings the approach to which indicates by size or position, inferiority of means or social position in their occupants.

The method of laying out New York, with streets all of a nearly uniform width, together with practical uniformity in the paving, lighting and policing of the streets, has made one street about as desirable a place of residence as another so far as civic regulation goes. Again, the uniform size of the lots has, hitherto, so generally governed the width of house fronts that an entrance, such as there is space for in the various applications of this System, can be made as elegant or imposing as the entrances of the majority of the best private houses, or apartment-houses hitherto erected in New York.

PRACTICABILITY: —

17. *Separate Ownership.*

It allows of Separate Ownership of each Dwelling; and of securing of the same by small weekly payments.

This differentiates this System from: — All dwellings and plans for dwellings in which the character of the plan, or the approaches to the different rooms and suites of rooms or other circumstances prevent or do not lend themselves to, separate ownership of the separate dwellings.

Separate ownership of an upper-floor dwelling, large or small, has long existed in Venice, and to some extent, elsewhere. About 1882 was built, it is said, the first apartment-house in New York in which the apartments on the different floors belonged to separate owners, with power, under certain conditions, to sell them. The custom

[1] The portion of the table to which each note is an appendix is here repeated before the note. Continued from No. 737, page 90.

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was soon widely followed in similar or smaller apartment and tenement houses throughout the city and opened a way for thrifty heads of families, of however small means, to become owners of homes in the city; a thing impossible to them so long as separate ownership of real estate in the city was confined by custom to owning, or renting on ground-rent, nothing less than a lot of some one hundred feet in depth, and owning all that stood on it. The admirable Building Associations of Philadelphia had gradually worked out the details of a method which put the possibility of acquiring, on most advantageous terms, separate ownership of homes, and other real estate, within the reach of all who paid rent, however small, for their houses or other dwellings. The details of such methods were readily made, with certain modifications, applicable to separate owning, in New York, and elsewhere, of apartments one over the other as well as adjoining. The incentive thus to economy, thrift, preservation of the safeguards of property, and to various forms of good citizenship, are apparent.

18. *Suits New York Lots.*

It can be used on New York Lots.

This differentiates this System from: — All dwellings, or plans for dwellings which, like the Peabody Houses in London, cannot be repeated on New York lots without waste of land, or else a radical change in the character of the plan.

Throughout England, a small country with a vast population, as soon as we get away from the heart of a large town or city, but while still within its limits, we find, in many directions, the ground covered with cottages and small houses, in rows, many of them but two stories high, with two rooms on a floor, one fronting on the street and the other fronting in the opposite direction on a small yard abutting on a similar yard, of a similar house fronting on the next street. A low one-story extension from the back of the house, for a scullery or out-house, takes off a portion of the yard-space on the ground-floor; but above this the space for light and air between the backs of the houses is seldom less than, say, about eighteen or twenty feet wide. Half this space, or the depth of one yard, say nine feet, added to the depth of the two rooms of the house, say thirteen feet each, would make, with the thickness of the walls, say, in all thirty-five feet for the depth of each lot. Allowing fourteen feet as the width of the house, a lot thirty-five feet by fourteen feet, which is inside of five hundred square feet, would be required for each such house and yard. In and about Philadelphia we find the ground covered with houses much smaller as well as others larger. In Philadelphia, in winter, the depth of frost in the ground makes a cellar or basement-room under each house almost indispensable. But farther south in the United States, and often, or most often, in England, we find the cellar or basement-room omitted; so that, small as is the cost of such a house in Philadelphia, it is still less in England. The demand for such houses is constant in England and the supply is constant, and such houses are even to be found in London notwithstanding the value of the land and the pressure of the population in a city many times larger than New York. And the demand for such houses is constant in Philadelphia and the supply is constant there though Philadelphia is only two hours distant from New York by rail. Yet no such houses are to be found in New York; because, in New York, all land is by law divided into lots twenty-five feet front by one hundred feet deep, which is five times as large as one of the lots just described. A regulation New York lot gives room for five such houses as just described, but gives no way to get to and from them. The land once laid out in regular New York lots is not re-divided so as to get smaller lots, and access to them, however much small houses like those in Philadelphia may be wanted, because the hope of increased value from causes wholly independent of itself — "the unearned increment," in a word — delays making use of the land in ways which may hinder or delay its sale at any future moment. Small houses on small lots like those of Philadelphia, and of English towns, are not built, nor any dwellings which would hinder the immediate sale at any moment of a single "lot." A speculative value takes the place of the value of immediate usefulness. The unit of exchange, the regulation-sized lot, established as a convenience for dealings in real estate and the fixing of the lines of streets, has now become an arbitrary factor forbidding the erection of houses on any method of land division not conforming to the twenty-five by one hundred feet lot. Small houses, however much needed, are not therefore built in New York, because small lots suitable for them are not procurable. Small capitalists who could compass the ownership of a small house and lot, but not of a large one, were thus forced to go out of the city or else relinquish the hope of ownership. Those who had capital enough to own a full-sized lot must further wait until they had capital enough to build not only such a house as they needed, but one many times larger, or else lose the full use of the lot as a building lot. Nor, when built, could the owner afford to live in the house with only his own private family, without further great addition to his means; without such addition he must fill the larger part of the house with tenants. Large capitalists were thus favored and small capitalists driven to the wall by the size of the lots, twenty-five feet front by one hundred feet deep, into which the vacant land in New York was, with the best intentions, thoughtlessly divided in 1807. This state of affairs continued for over two-thirds of a century, or until ownership of separate floors and parts of floors in a house was introduced. The large size of these lots has thus retarded the growth of New York by practically prohibiting that providing of small houses for families of small means which so largely contributed to the marvellous growth of London and of various other cities during the same period. It has kept away a vast population of respectable families of moderate means, discouraged marriage, and lowered the birth-rate of the city; while the want of proper ventilation in the tenements which were the only form of small dwelling for many years found practicable, on the New York lots, increased the death-rate, and especially the death-rate among children.

19. *Available Everywhere.*

It can, in some of its forms, be made Available Everywhere.

This differentiates this System from: — All plans suited only to corner lots, or to lots of certain dimensions; or to local, or national, customs or requirements.

The concentration of residence, coupled with great discomfort, that grew out of, and has been practically forced on by the New York uniform deep close-back lots, has made it further necessary that any system aiming to supplant it, should, in order to have even a hope of adoption, retain the same high rate of concentration, while getting rid of the discomfort. Hence a prize offered in New York, in 1879, was for the best method of housing four families on each floor on a space twenty-five feet front by ninety feet deep, shut in at the sides, but with a yard at the extreme rear of the ninety feet, ten feet deep, for light and air, as required by law, making the full depth of the lot one hundred feet. The same degree of concentration is maintained in an application of this System, printed in the *American Architect and Building News*, May 5, 1888; but, to secure comfort, all the factors named in the column of factors of this System are there combined with that high degree of concentration. By using the same factors with greater space, still greater desirability in the residences, in the number and size of rooms, etc., will be secured; but the higher the rate of concentration the more important it is not to deprive any of the dwellings of any of the features named as factors of this System.

A high degree of concentration of residence is likely, sooner or later, to be found wherever nearness to any single point becomes a matter of convenience and so of advantage and profit. Rarely, however, is such concentration foreseen when the buildings are built which afterward become divided up so as to form crowded dwellings; neither hitherto, has the giving to each of the dwellings in a highly concentrated congeries of dwellings the advantage of all the factors embodied in this System, been generally, or at all, looked for. In the crowded parts of most cities in all countries many, probably the majority of, dwellings never see the sun, or never see it in the winter season when sunshine in the dwelling is most welcome and beneficial. In Continental Europe many dwellings have no command of a through-and-through draught of air; and in New York and wherever deep close-back lots have long prevailed in closely built cities, many dwellings have neither thorough-draught nor adequate provision of air or light.

In new States and colonies and wherever virgin sites are laid out for buildings which may ultimately present any form of concentrated residence, a street and lot system like that of New York often is, and in the future often is likely to be adopted on account of its great simplicity. It is easily described and understood, and from being a rectangular system is easily applied. These merits, and the fact of its being largely in use, are patent and present; while a knowledge of the evils which have ultimately followed its adoption is absent; or, if known, the evils still seem remote. Further, it is quickly recognized that such a system, which divides up land, though only on paper, into small uniform-sized parcels, having, as nearly as possible, uniform natural and civic advantages, facilitates its immediate sale by putting it in a handy form for such purpose; and facilitates its future successive sales, at any time, by a form fixed and identical in shape and size with that of its fellows. A constant unit of value established in the land of a locality, which, like any other unit of value, wampum, cowrie shells, paper money, or coin, may change in value relatively to other commodities, but cannot readily change in value relatively to adjoining units, of the same kind. Whatever puts up the price of one lot generally puts up the price of adjoining lots. Profitable uses to which lots far distant have been put also adds to the value of like lots everywhere, so far as there is a chance of their ever being wanted for a like use. Land once laid out in "City Lots," and particularly in such city lots as those above considered are rarely likely to be redivided if any of them have been once sold. Each owner hopes from his one lot the profits from the greatest concentration of dwellers known on any similar lot anywhere. It is held, whether for sale or not, with these hopes attached.

Throughout the north and west of the United States, and in some of the British Colonies, land, in many places likely to become centres of population, has already been laid out, as in New York, in deep close-back lots. The evils which have accrued to concentrated residence on such lots, in New York and elsewhere, can be avoided by using this System; and, except the New York sea-breeze, every advantage of the System can be everywhere secured. For places south of the equator the arrangement has only to be reversed, using south for north. It is only when lots have been laid out with their longitudinal axes not in line with the meridan, or direction of a shadow thrown of an object, by the sun at noon (or nearly so, as in New York) that the System would lose the factor of command of

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sunshine, while retaining its other factors, and only then if the buildings were placed with their axes in line with the axes of the lots as laid out, instead of in line with the meridian. So that the System is of value wherever a high degree of concentration of residence is desired to be combined with comfort. It is applicable both where land has been and where it has not been already laid out in lots. By its use may be anticipated the slow teaching of experience with all its attendant losses, discomfort and disease.

USEFULNESS: —

20. *Meets Pressing Needs.*

It meets pressing needs for Comfortable Housing for all Classes in New York, or wherever population is dense.

This differentiates this System from: — All plans for housing only certain classes (*e. g.* the "working classes";) or plans which (as in the laying out of the streets in Philadelphia) practically tend to separate as to streets and neighborhood those of different means, and so lack (however otherwise admirable) availability for future general use.

In the cities of all countries, a pressing need, not only of the future but of the present time, is of dwellings which, however small, however simple in adornment, or however economical in construction, are such that persons of the greatest refinement of taste and habits can live in them without discomfort, and even with satisfaction and pleasure.

21. *Provides a Way of Avoiding New York Tenement-house Evils.*

It provides a way of avoiding the tenement-house and apartment-house evils hitherto prevailing in New York, which are bred there and elsewhere, by the exclusive employment of an inflexible system of deep close-back lots.[1]

This differentiates this System from: — All plans of, or for, Improved Tenement-houses or Apartment-houses, in New York or elsewhere, which lack the features of this System named above as factors Nos. 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, and 16.

The report on the tenement-house evils in New York by the President of the Board of Health, December 1887, already quoted from, presents, not only a résumé of the history of the rise and progress of those evils, but a further history of the gradual lessening, or conquering, of many, perhaps most, of those evils, and affords a most hopeful outlook for the future. In time, doubtless, by the slow, but sure process of elimination of the undesirable features of successive buildings, an eradication of all possible removable objectionable features, and the additions of all possible desirable features will be arrived at. It is over eighty years since the street and lot system which has originated and bred the rapid growth of the worst of those evils, and presented the greatest obstacle in the way of overcoming them, was adopted; over fifty years since the existence of some of those evils was developed; between thirty and forty years since their existence was generally deplored, but efforts made to lessen or prevent them were hampered or discouraged by the general assigning of their cause to the small size of the island on which New York was built; over eleven years since the publication of a circular pointing out the deep close-back city lots as the source of the worst of those evils, an opinion founded on studies in the distribution of areas, on the vast space, more than half the area of the island, still unbuilt on, and on the presence of the same evils in Brooklyn, Jersey City and even remoter and smaller places, where the New York street and lot system had been followed; over nine years since a very general philanthropic movement resulted in the offering of a prize for the best method of overcoming those evils within the limits of one of the lots which are the cause of the evils. Thus, for years there has been a constant effort for improvement, the success of which has gradually increased, and has of late been especially marked. Many houses have been erected entirely or partly from philanthropic motives with a view to providing better dwellings for such as otherwise must dwell in the old and faulty tenement houses; while, at the same time, the latter houses have been improved very generally, some in a few, and others in many ways. The introduction of apartment-houses, or flats, about 1865 with every appliance for convenience of the best dwellings, combined with spacious suites of expensively fitted rooms, has been followed by similar houses with smaller suites but embodying like conveniences; until now the line of demarcation between many apartment-houses and the best tenement-houses is practically lost.

But these advantages are still detracted from by the lack of direct light and means of adequate ventilation in many of the rooms, and especially the sleeping-rooms, in by far the larger number of these buildings. Such rooms, however otherwise convenient, are neither cheerful, comfortable, nor wholesome. Their existence in such numbers proves either indifference to these discomforts or else that no way has hitherto been presented and made widely known of altogether avoiding them while yet securing such a high degree of concentration of residence in a given space as in all cities is always more and more being sought for. But the tone of complaint on this subject, constantly being voiced by the press, forbids the idea that people who suffer from these discomforts are indifferent to them. And, in all probability, for one who speaks, multitudes who sympathize keep silent. Few are inclined to speak of, or dwell on, discomforts which their lack of means obliges them to put up with, however glad they would be to avoid them. Certainly increased public education and refinement, however they may help men to bear losses which do not involve self-respect, do not render them more indifferent to these peculiar discomforts, nor to many others the avoidance of which most completely, and with least loss, makes up the problem of concentrated residence.

The table to which these notes apply shows what the author deems would be further improvements in any plan for concentrated residence which did not already unite all the factors here named and combined in a System; and gives the reason for thinking that such a System provides a way of avoiding New York tenement-house evils.[2]

E. T. POTTER.

[1] See Circular by the author: To whom it may concern, December 20, 1876.

SAFE BUILDING.[3] — XXXVII.

Example III.

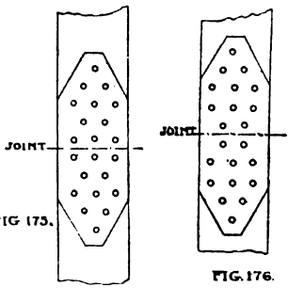

FIG 175. FIG. 176.

Butt-joint Two Cover-plates. *Same problem as before, but two cover-plates to be used, one above and one below the joint.*

We will again decide to stagger the rivets and losing only one rivet-hole will again require a 1″ thick plate.

Required number of rivets. Now, for bearing we will have the same result as before, *viz*: 9 rivets required, but in shearing it is evident that now each rivet has two resisting areas or is in double shear, so that we will need only one-half of the previous quantity or $\frac{17,2}{2} = 8,6$ or say, nine rivets. Had we used Formula (111) we should have obtained this result, for:

$$x = \frac{135000}{1,5714.\ 1^2.\ 10000} = 8,6$$

For the bending-moment we use Formula (113) and have

$$x = \frac{135000.\ 1}{0,7857.\ 1^3.\ 18000} = 9,5$$

or say ten rivets required to resist cross-breaking. This shows how much better proportioned the different strains (shearing, bending and bearing) are to each other, where we use two cover-plates. Had we calculated directly without use of formula we should have obtained the same results. We have already calculated net area of plate and bearing value of rivets in *Example II*, also the single shearing value, which was 7854 pounds per rivet; as we now have two areas this would be doubled or the resistance of each rivet to shearing would be 15708 pounds and the number required $\frac{135000}{15708} = 8,6$ as before.

Advantage of Two Covers.

For bending-moment we should have a 1″ circular beam with a clear span of 1′, uniformly loaded with 135000 pounds.

From Formula (21) we have the bending-moment

$$m = \frac{135000.\ 1}{8} = 16875 \text{ pounds-inch}$$

Moment of resistance will be as before

$$r = 0,0982$$

Therefore the total strain on all the rivets

$$s = \frac{16875}{0,0982} = 171843$$

This divided by $\left(\frac{k}{f}\right) = 18000$ gives the required number of rivets as before

$$x = \frac{171843}{18000} = 9,5$$

Designing the joint. We now design the joint, as before, remembering to stagger the rivets and to place the required number each side of joint. The greatest number required was to resist cross-breaking, *viz*., ten.

We can design as shown in Figure 175 or as shown in Figure 176; both require eleven rivets each side of joint, but cover-plates in Figure 176 need only aggregate $1\frac{1}{8}$″ in thickness, that is be $\frac{9}{16}$″ thick each; while those in Figure 175 would have to aggregate $1\frac{5}{16}$″ in thickness, or be, say, $\frac{11}{16}$″ thick each.

Joint shown in Figure 175 looks a little better, but otherwise there is no preference.

Covers of same thickness. If cover-plates are not equal in thickness each side of plate, it would require very many more rivets. Each rivet would become a double lever, with its central part built-in and a projecting free arm each side, the length of arms being equal to their respective thicknesses of cover-plates. The load on each arm would be the proportion of whole strain, that the thickness of its respective cover-plate would be of the whole required (aggregate) thicknesses of cover-plates.

[2] In an intermittent, but almost constant, study, in several countries, of this subject, since circumstances, over thirty years since, called his attention to the mortality, suffering, and discomfort consequent on the lack of thorough-draught, or even proper air or light in the bed-rooms of New York tenement-houses, the author has found no buildings, or plans for buildings, uniting the factors which he has tabulated and combined in a System.

[3] Continued from No. 722, page 197.

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There would be no sense in such an arrangement however. It would produce all sorts of unequal stresses, in shearing, bearing, cross-breaking, etc., and should be avoided. Riveted work at best is very theoretical, as the calculations depend entirely upon the accuracy and fit of each rivet. If a single rivet fails to do its share, it will at once disarrange all the strains and produce unequal stresses in different parts. Still if the above rules are followed, riveted work can be used with perfect safety. Where the result gives a fraction, a whole rivet should as a rule be used in place of the fraction. If the necessary spacing requires still more rivets, they can either be used, or, all the rivets can be reduced in size enough to bring them nearer to the allowable stresses.

No account has been taken of the loss due to punching, for this will affect the plate in tension mainly, and the safe stresses allowed for tension are very low. In compression the metal would not be strained as heavily as in tension, for the rivets will not weaken the plate so much if they entirely fill the holes, thus giving full bearing on the entire plate. Then, too, the butt joint if planed and carefully made and joined, will transfer directly more or less of the compression.

No reliance on butt.

But in all good work it is customary to place no reliance whatever on the butt, and to calculate in compression the same as for tension, namely, sufficient *net* area in each plate, at its weakest section, to resist the whole compression strain.

Explanation of Tables.

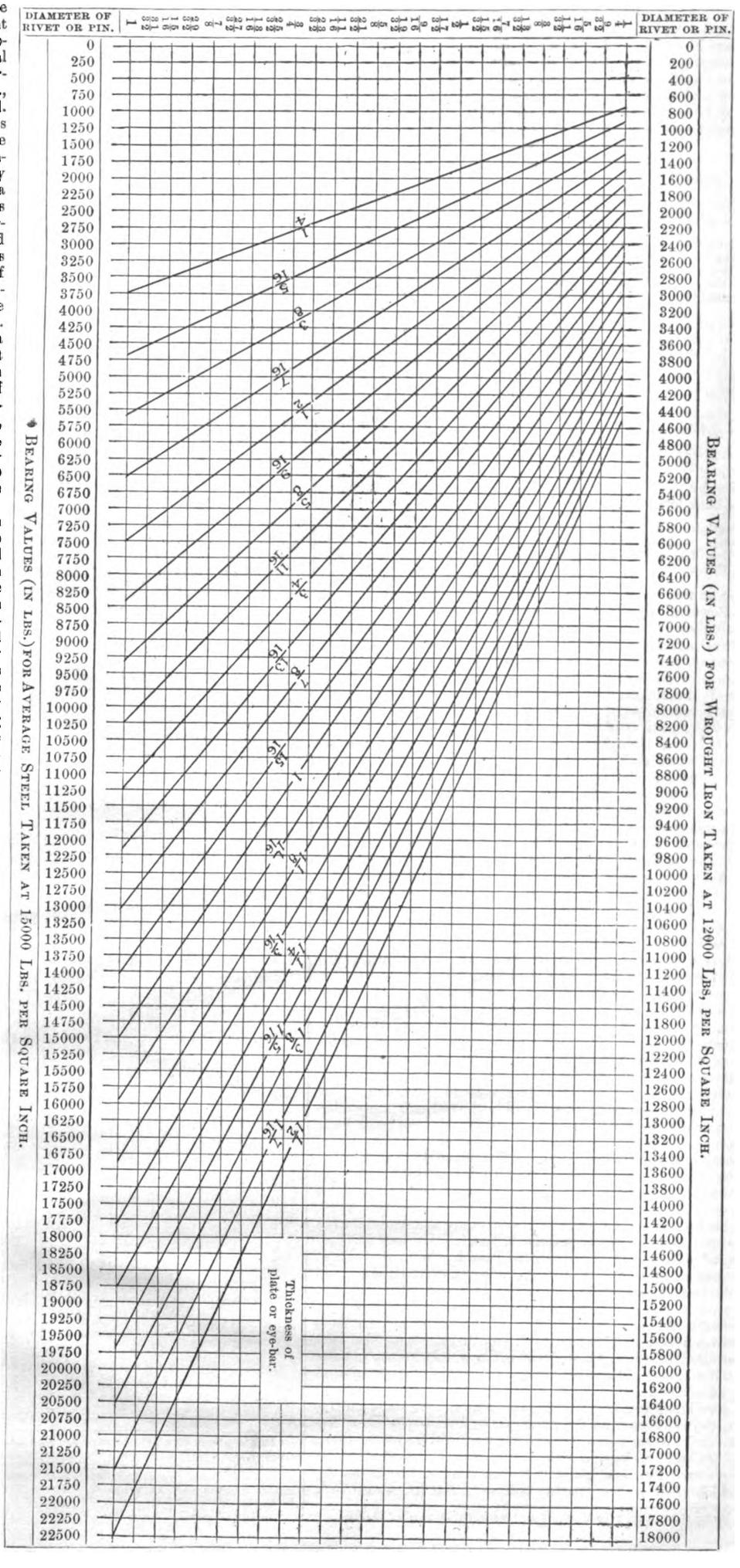
Tables XXXV to XL inclusive, have been calculated and laid out to save most of the wearisome figuring necessary in riveted work and in connection with pins. The first three give the bearing value of pins and rivets against eye-bars or plates, and the latter three the values in tension, single and double shearing and in cross-breaking of pins and rivets. All the tables are laid out for both steel and wrought-iron.

Tables XXXV, XXXVI, XXXVII.

The full heavy straight lines in Tables XXXV, XXXVI and XXXVII represent the thicknesses of plates or eye-bars against which the different sizes of rivets or pins bear. The thicknesses given are from ¼″ to 1½″ in Table

Table XXXV.

Bearing Values for Iron and Steel Rivets and Pins.



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XXXV and from ¼″ to 2″ in Tables XXXVI and XXXVII; all by $\frac{1}{16}$″. For thicker plates or eye-bars it will only be necessary to increase the bearing value found, in proportion to extra thickness.

The columns to the left give the diameters of pins and rivets, running in Table XXXV from ¼ inch diameter (by $\frac{1}{32}$ inch) to 1 inch diameter; in Table XXXVI from 1 inch diameter (by $\frac{1}{16}$ inch) to 3 inches diameter; and in Table XXXVII from 3 inches diameter (by ⅛ inch) to 6 inches diameter. The figures at the *tops* of these tables give the bearing values in pounds for wrought-iron, and those along the *bottoms*, the bearing values in pounds for average steel.

LOUIS DECOPPET BERG.

(To be continued.)

COHESIVE CONSTRUCTION.[1]

APPLICATIONS. — INDUSTRIAL SECTIONS.

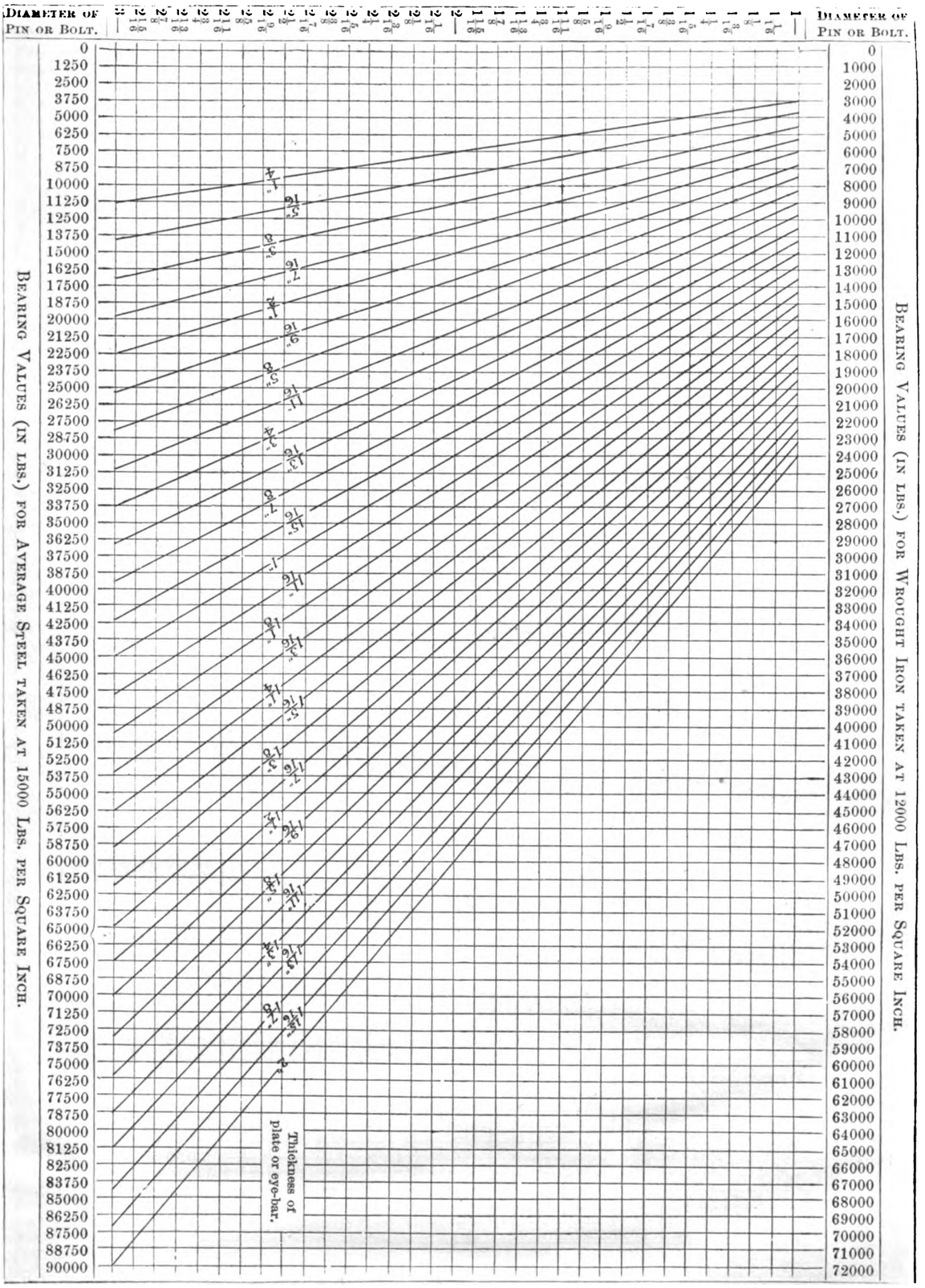
IN Barcelona we have a family called Muntadas, which we can say is a genuine representative of the aristocracy of the manufacturers of Catalonia. All of the members of this family are, or have been, manufacturers, and together they employ in the towns of Barcelona, St. Martin, Sans, Gerona and Ripoll, more than six thousand people in their bleacheries, manufactories, dyeing and printing buildings.

One of the members of this family owns in the Department of Zaragoza a rich and extensive property, that for centuries was

[1] Lecture delivered by R. Guastavino before the Thursday Club, January 2, 1890.

TABLE XXXVI.

BEARING VALUES FOR IRON AND STEEL PINS AND BOLTS.


DIAMETER OF PIN OR BOLT.
BEARING VALUES (IN LBS.) FOR AVERAGE STEEL TAKEN AT 15000 LBS. PER SQUARE INCH.
BEARING VALUES (IN LBS.) FOR WROUGHT IRON TAKEN AT 12000 LBS. PER SQUARE INCH.
Thickness of plate or eye-bar.

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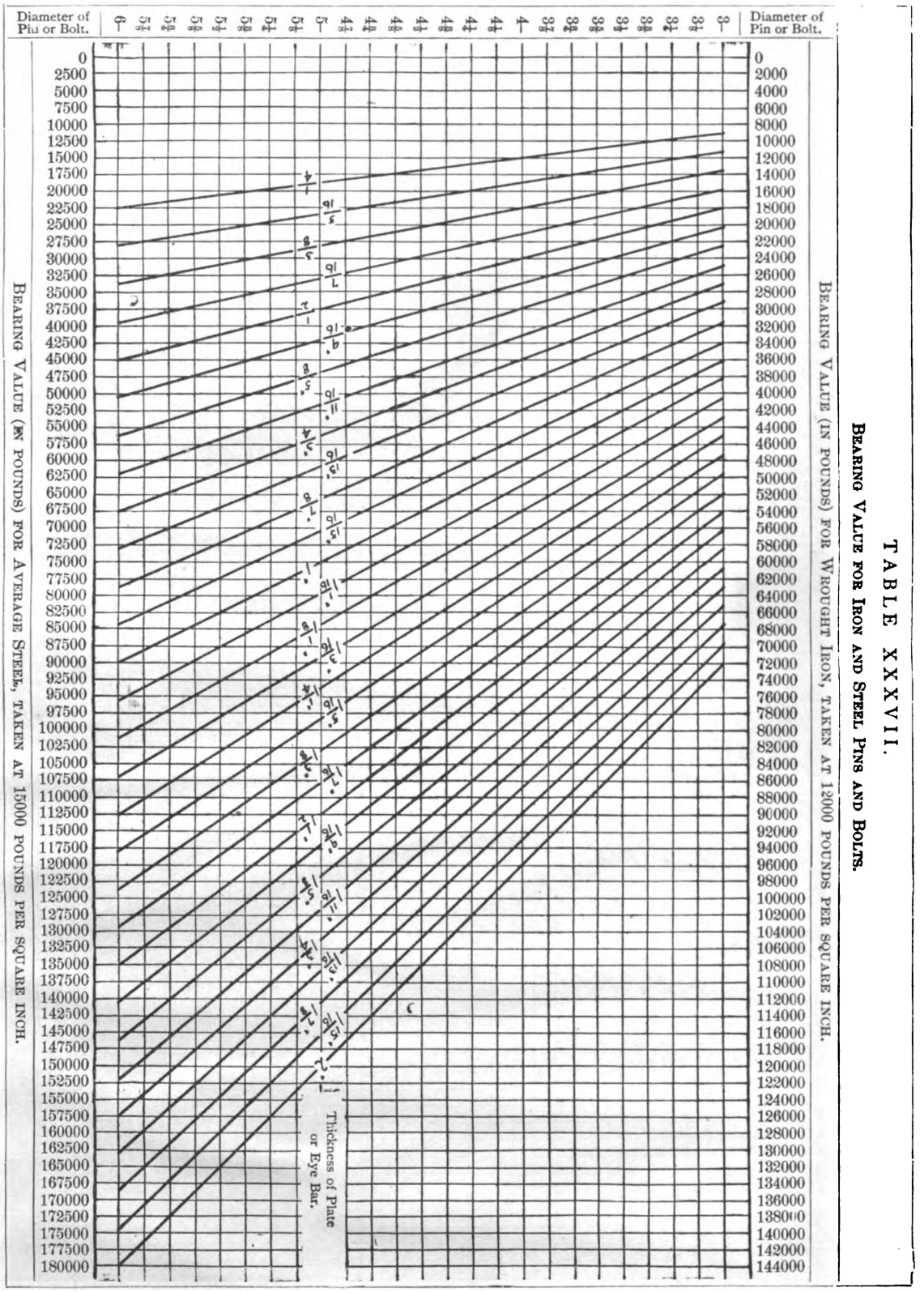
possessed by the monks and is called "The Monasterio de Piedra" (the Stone Monastery); this tract contains about 50,000 acres, and the buildings thereon, which consist of churches, convents, and the Palace of the Abbot, all of different epochs, Romanesque, Byzantine, Renaissance and modern, cover about 100,000 square feet of ground.

The owner Don Frederico Muntadas (who is a great litterateur, and pisciculturist) lives there with his family a large part of the year.

nary works of nature. Imagine Trinity Church covered by an immense natural vault, supported by walls of the same nature, with gigantic stalactites of all kinds of forms and dimensions like great chandeliers hanging from above; the floor a lake; receiving the whole light through an immense vent, or opening like a rose-window in a cathedral, covered by the fall of the full mass of water of the river Jalon, *its builder*, that passes over the vault and is pre-

TABLE XXXVII.

BEARING VALUE FOR IRON AND STEEL PINS AND BOLTS.


Diameter of Piu or Bolt.
Diameter of Pin or Bolt.
BEARING VALUE (IN POUNDS) FOR AVERAGE STEEL, TAKEN AT 15000 POUNDS PER SQUARE INCH.
BEARING VALUE (IN POUNDS) FOR WROUGHT IRON, TAKEN AT 12000 POUNDS PER SQUARE INCH.
Thickness of Plate or Eye Bar.

I was invited by this gentleman, through his uncles Don José and Don Ignicio Muntadas, to visit this property, as they intended to convert the immense convent into a summer resort. It was in October, 1871, when I made my acquaintance with this estate, which is four miles from the railroad station of Alhama, a noted hot-spring resort. It was here in this "Monasterio de Piedra" that I saw a grotto of immense grandeur, one of the most sublime and extraordi-

cipitated more than two hundred feet, taking the form in its fall of a horse's tail, which is the source of its name, "Cola de Caballo."

I had just left Barcelona after completing some buildings, among them the large manufactories of Batllo' Bros., and was under the impression that I had done something in these buildings in the Cohesive System, but within this grand specimen of Nature's Architecture, I realized how small and insignificant my work had been.

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The thought came to my mind in this immense room, viewing this fall of water, that all this colossal space was covered by a single piece, forming a solid mass of walls, foundation and roof, and was constructed with no centres nor scaffolding, and especially without the necessity of carrying pieces of heavy stone, and heavy iron girders; all being made of particles set one over the other as nature laid them. From this time, gentlemen, I was convinced that we can learn everything in this immense book called Nature, never enough studied, and that our ordinary system of constructing was very poor, notwithstanding we possessed the material for this kind of building, in imitation of Nature. I understood why my distinguished Professor of construction in the Academy of Architecture in Barcelona, D. Juan Torras, said, "*The Architect of the future will construct imitating Nature, because it is the most rational, durable and economical method.*" This grotto is really a colossal specimen of cohesive construction. Why have we not built on this system? This is not the time to answer that question. To those who are interested I would refer my lecture before the Society of Arts of the Massachusetts Institute of Technology, October 24 last.

In the South of Europe and in Asia there exist to-day many buildings in the Cohesive System, built, centuries ago, much as I am now building, except that their processes were too slow for this age. We better appreciate the worth of time and our method must be more rapid.

The types are: cupola of Saint Sophia, cupola of Cathedral of Zamora, Moorish constructions in Spain, and others in Asia.

Under these impressions I commenced work in Barcelona, beginning with my own private house, corner of Aragon and Lauria Streets, where I tried on myself, as a physician who first tries his own medicine, the effect of my ideas, building a construction four stories in height, practically with no beams.

Afterwards I built the bleacheries of Muntadas Aparicio & Co., a manufactory of merino and woollen goods for Carreras & Sons, another in Villa Franca for Michans & Co., the glass manufactory of Modesto Cassademunt, the Theatre of Villesar, the manufactory of porcelain for Florens & Co., silk manufactory of Saladriguez, some applications in the private house of the bankers D. Victor Blajot and D. Andres Anglada and others.

Some of the plans of these buildings were represented and rewarded at the Centennial in 1876. This together with the Chicago fire, which made a great impression on the European mind, persuaded me that this country was the place for the system; but I did not succeed in getting here until 1881, and then I spent several years studying American methods and material.

After a severe experience in this country, I began with the construction of a private house on Seventy-eighth Street, New York, owned by Bernard S. Levy, four stories high, built on this system. In the same year I began the building of the interior of the Arion Club, New York. The building-committee accepted my proposition when they ascertained that in the arches they could make a saving of over $5,000, in two floors, over the ordinary system of fireproofing. From this time I have been building in New York, having erected all kinds of constructions; but the first opportunity of putting this system into a manufactory in this country was given by Mr. T. M. Clark, the distinguished architect of this city, in the Coolidge Building and Organ Factory on Irvington Street, Boston.

As the object of this short lecture is to show the application of this system to mills and factory-buildings, and workmen's homes, colleges, etc., we will now begin with some facts that may prove interesting.

The Cohesive System is the most adaptable and economical for this kind of structures for the following reasons, which we will divide into two forms:

First: Economy in the qualities or mechanical conditions of the construction.

Second: Economy derived from comparison with the general systems in use, price by price.

Economy coming from the qualities or mechanical conditions of the construction is as follows:

1. Rigidity in the floors, representing an economy in coal. It is evident that all oscillating movement in the floor is a loss of power that represents at the end of the year a sum of coal consumed in excess. In the walls and floors of our system the rigidity is absolute, and in a building of great surface, that represents, as I have found by experiments with the old and new factories of Muntadas in San Martin, before referred to, a net saving of between five and six per cent.

2. It is common to see in wooden floors a warping of the wood, caused by the change of temperature or humidity, or by currents of air or the proximity of heated bodies, thus changing the level; consequently, the machinery is thrown out of level; then ensues a loss of power if the machinery is not re-levelled, or, when this is done, there is no certainty as to its stability, as another change is imminent. The same is true when, in consequence of the bad setting of the beam in cases where no ventilation is provided for the ends, dry-rot is precipitated more, if care has not been taken in the use of the lime. It is very frequently the case that such beams have to be replaced. In our system all the material is permanent, like solid walls.

3. We know the necessity for the use of grease and oil in factories, and the dangers attendant thereto, especially in cotton-mills, because of its extreme inflammability, and as all manufacturers require great room-surface, and as many parts of the room are far from the exit, there is a constant menace to safety.

In factories constructed on the Cohesive System, the floor being laid with tiles, nothing is affected by the oil; the cotton, if it takes fire, has nothing to burn; no iron-work is exposed; all is clay, like the samples shown.

Second: The second reason, or the economy derived from comparison with the general system in use, price by price, is as follows:

It is evident that light materials of equal strength, and the use of each material in the way required by its nature, is the base of building economy: that is our constant view. If we put the wood or iron to work under deflection, or submit them to transversal pressure, surely we shall need more material than in using the same wood or iron under tension. Both iron and wood have the greatest coëfficient when working under a single tension, and ought always to be so worked. If we place them in this position, designed for them by nature, we will here have an economy. The same is true when we put clay and cement to work by pressure; they then have their greatest coëfficient, and can replace the iron and work with economy. In a floor in the ordinary system we find wooden or iron beams, and, between, wooden planks or brick arches. What are the wood and brick arches doing? Only bridging between the girders or beams; all this material between is not working at all, the total weights are supported only by the beams or girders, and these bridges contribute only to the weight. But in the Cohesive System, if well applied, every piece of material is working directly and just as is necessary; the clay works to support itself, working by pressure, and the iron works as a rod. That is the great economy, and you, gentlemen, as practical financial men, will admit that, with these conditions, it is not strange that this system, although the material in itself is dearer, can compete with the "Slow-burning Construction," as I show by plans and estimates that you can compare. Here are the plans, but first permit me an explanation. [See Illustrations].

These plans are merely for the purpose of showing the application of this, our system, to factories, bleacheries and operatives' houses. I do not pretend that they cannot be improved, though they are the result of twenty years' experience in all sorts of buildings, especially in factories. All human work is susceptible of improvement, especially my own; consequently, the architects and the owners will have the services of the Guastavino Fireproof Construction Company only as contractors disposed to execute their ideas inside of this system. That is our business; but we cannot, we will not, act as architects, but only as builders.

The plans are: First, a Fireproof Factory. As these buildings have only a utilitarian object, it is not necessary to give them any artistic effect; the outside and inside walls will be left rough, except the inside walls of the workmen's houses, which will be left in plain plaster. The solidity of the structure is only taken into consideration, and on these conditions prices are based. The artistic part of the plans is only to show that any ornamentation or artistic finish can be done in this system if desired. The effect will be a rough surface, solid and substantial, and as the principal element in this system of construction is the cement and the tiles are but a mixture for rigidity, to give thickness of section, and as the cement afterwards is harder than the tiles, the joints will be irregular, as the clay comes, without any cutting or symmetrical pointing: this gives its own characteristic good effect.

DESCRIPTION OF THE BUILDING AND ITS CONSTRUCTION.

The walls are constructed of clay tiles, the piers being built hollow and utilized as ventilating-flues. The beams are all covered in the arches and are working under tension.

Hard-burned clay tile floors etc., fireproof columns, no iron exposed.

It contains on each floor in addition to space appropriated for manufacturing purposes, offices, store or sample rooms, and toilet-rooms and fireproof stairs. The building is well lighted and ventilated and is adapted for almost any kind of manufacture. The stories are 14′ 0″, 13′ 0″, 12′ 0″ x 14′ 0″ respectively with bays 25′ x 10′ 6″.

The safe load is 350 pounds per square foot, six months after being built and 150 pounds one month after being built.

The building is four stories high, 238′ 0″ deep and 134′ 0″ wide making 26,000 square feet, and price is based on nothing smaller.

The cost is 89 cents per square foot for each floor, including wells, floor and iron construction against 75 or 80 cents per square foot of wood floor and girders and walls.

SECOND. BLEACHERIES.

All the conditions given for the factory building will be applied in this, but the plans are the fac-simile of one already built in Spain. Price for bleachery of 12,000 square feet, 80 cents per square foot. If less than 6,000 square feet, the walls will be 6 inches, with piers of 6 inches additional.

THIRD. HOUSE FOR WORKMEN. BRIEF DESCRIPTION OF THE BUILDING AND ITS CONSTRUCTION.

This building is in the form of a double tenement 35′ 0″ x 35′ 0″.

The entrance hall is 4′ 5″ x 11′ 0″ and is used by both tenants. Each tenant has on the ground-floor a kitchen 11′ 6″ x 11′ 0″ which can be used as a living-room, a parlor or sitting-room, 9′ 6″ x 11′ 6″, also pantry 4′ 10″ x 5′ 3″ and closet or store-room 4′ 10″ x 5′ 3″, with private hall between kitchen and parlor, also separate water-closet, and separate door and yard. These stairs are used jointly by both tenants and are entirely fireproof (no iron). On the second story each tenant has three bedrooms with private hall connecting the front and rear rooms. The front bedrooms have each a closet. The stairway hall is lighted by a skylight. This arrangement gives each tenant five rooms, pantry-closets and water-closet. Each story is 10′ 0″ in the clear.

This building is exclusive of the foundations and cellar.

Price $3,000 to $3,500, building ten double houses at a time.

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The rent at 6 per cent for both tenants, would be $210, or but $9.15 per month for each tenant without taxes, etc.

The outside walls are built of blocks of tile, each block containing six tiles with air-spaces between them as shown by detail-drawings.

COLLEGES AND SCHOOLS.

The plans for colleges and academic buildings are not yet drawn but in the matter of economy there would be the same saving as in all other buildings devoted to a special object, with the difference that the exterior must be more expensive, corresponding to the higher moral order of the building, but in the interior we would have the same mechanical conditions.

I must here remark that the constructive lines corresponding to the cohesive system, derived from the mechanical line of pressure is just the continuous curve or round form required by the laws of hygiene for good ventilation, avoiding corners that confine the impure air. Another condition of hygiene is that each room is absolutely isolated from those adjoining, thus making it cooler in summer, and warmer in winter, because the floors are absolutely tight.

Still another condition is the hollow wall which as well in manufactories as in dwelling houses secures absolute absence of dampness in the walls and of condensation. These hollow walls permit the building to be ventilated in the corners of the rooms where the impure air collects, and permits a greater section of ventilation than can be had in any other system without affecting the solidity of the building. This is a source of great annoyance to architects when a building requires a great number of flues, as they have difficulty to find places on which to lay the beams, having to make header after header, sometimes resting half a floor against the head of a single beam, thus constantly torturing the brain of the architect to make suitable framing-plans. But in our system this trouble is entirely avoided, all our walls and floors are tubular and every part of the room can be well ventilated in every direction.

Although this is outside of our subject, permit me to remark that these tubular walls, and tubular ceilings also facilitate the establishing of a system of pipes, to connect every corner of the room with the fire-box or grate of the boiler-fire, range or furnace in order to burn the air, passing it through the flame, which is the best way to transform impure air; such an appliance as this can be used for the ventilation of college buildings, and to any who are further interested in this matter, I would refer them to plans and treatise sent by me to the Centennial, on "Improving the Healthfulness of Industrial towns," for which I was granted a certificate of award, signed by your distinguished fellow-citizen here present, General Walker, as Chief of the Bureau of Award.

MATERIALS.

My intention is not to uphold the use of concrete in construction where cohesive strength is required, because it is a slow process; it works only by pressure, and there is no shearing strength in the joints, neither chance for perfect setting. It makes a heavy load, especially on the centres during construction, producing a great load of dampness in the building, and is ruinous for patching or alteration. After several years' experience in concrete construction with no satisfactory results, I have come to the conclusion that the tubular system as applied in constructing walls and ceilings with light and well-burned clay, and good Portland cement is the best, safest, most substantial, economical and rapid method of construction in the cohesive system, for our dwellings or in any kind of buildings. By light and well-burned clay, I mean such as was used by the ancients, which although as strong as the others (from 1,500 to 2,500 pounds per square inch), has a specific gravity less than water.

The mortars used must be of the quality called hydraulic — *i. e.*, mortars that do not need exposure to the air for setting — which for our especial work is Portland cement.

The bricks must be of as large dimensions as a man can easily handle, and of such weight that a man can work with them all day. The result of these conditions is a brick of about four pounds weight (for the clay commonly used); about an inch thick, and of seventy-two square inches surface, or 6″ x 12″. These tiles must be a little porous, in order to absorb some of the excess of water in the cement; the breaking load for a square inch of tile is between two and three thousand pounds.

I must remark that we have yet a great deal by way of improvement to do, and it is necessary that I call for assistance in perfecting our knowledge of the art of building, especially from manufacturers of materials and architects.

There are three things to be improved.

1. The technical part ought to be put in a treatise, in order that it may be used in the technological schools for the benefit of the constructive art.

I have the satisfaction of saying that this matter is in the hands of one of the eminent professors of the Institute of Technology, I refer to Prof. Gaetano Lanza, who has given some figures and ideas which show that these important matters could not be in better hands.

2. To the manufacturers: Our tiles, as well as our bricks, are too heavy. The cupola of St. Sophia has some rings that were built with *lava* (pumice stone), some with brick that was so light that it would float in water; we have some of this kind of clay in Spain, north of Valencia; Alcora says that perhaps the people working in the old mines between Pensacola and Valencia used this kind of clay, but investigations on my part have failed to discover it. The idea of looking for it in the mining districts, led me to make a search for it in Colorado, with flattering prospects: I have here a specimen from Colorado — heavy, for floors, but we are having them lighter for ceilings.

The far West is much advanced in the preparation of fire-clay, as much as we are in Spain; and in some parts of Mexico they are better prepared than here in the East for ceramic-work applied to architectural purposes, and have given some attention to the lighter brick.

It is an error to believe that the heavy brick is the best; the light brick, which I mentioned, has a breaking strain of 2,200 pounds and will float in water; this is the help that we need from the manufacturers.

ECONOMY IN THE FUTURE.

The clay in our tile is about the same as that in the common brick, and the volume is about the same, *i. e.*, from 4, 4½ to 5 pounds. Our tile is 1 x 6 x 12 inches or 72 cubic inches, and the brick is 2¼ x 4½ x 8 or 72 cubic inches, but we have to pay from $18 to $20 per thousand for the tile, while the brick costs from $7 to $9 per thousand.

When we consider that the tiles are made in blocks of six tiles each, and thus are more easily handled than brick at the factory, that they are thinner, thus drying more quickly and being easier burned with less fire, it would seem that they ought to be made more cheaply than brick, and such is the case in Spain where brick costs from $6 to $7 per thousand, and tiles from $4 to $5 per thousand.

This anomaly is perhaps due to the fact that as yet there has not been sufficient demand for these tiles here to cheapen their manufacture by producing them in large quantities.

In regard to the cement, we now have to pay to English manufacturers a large contribution on the Portland cement we use; when it can be safely made in this country, I suppose it ought to be about 20 per cent cheaper. We ought from these two sources alone to be able to cheapen construction from 20 per cent to 30 per cent.

3. To the architects: In concluding, permit me to put before you the following thoughts that are not of my own, but of one of the eminent English authors of the first part of the century.

What is the best type of structure, that which for equal periods of duration has more per cent of its full-covered area occupied by solid walls, or that which has less of its surface so occupied by walls?

In the contemplation of buildings which show their strength by their age, the comparative science displayed may be partly estimated by an inverse ratio of mass of materials, to the space covered.

The following list of notable buildings, with the per cent between the areas covered and the wall-surface, may be interesting:

Of the superficial feet of walls of the Church of the Invalides, at Paris, two-sevenths of the whole is solid.

St. Peter's, Rome, one-fourth.
St. Paul's, London, two-ninths.
Pantheon, Rome, one-fourth.
St. Geneviève, Paris, one-seventh.
Salisbury Cathedral, one-fifth.
Temple of Peace, one-seventh.
Parthenon, two-elevenths.
St. Sophia, *cohesive* system, one-eighth.

A great building with few materials, besides the periodical approbation that it will receive from the age, will have an indisputable superiority as a rule.

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF W. A. BURNHAM, ESQ., BEACON ST., BOSTON, MASS.

[Helio-chrome, issued only with the Imperial and International Editions.]

FIRST BAPTIST CHURCH, ELMIRA, N. Y. MESSRS. PIERCE & DOCKSTADER, ARCHITECTS, ELMIRA, N. Y.

THE church is to be built of common red brick, with red mortar, and Hummelstown sandstone trimmings and slate roof. The interior is to be of oak, finished on the grain; to be heated and ventilated by the Smead-Rutan system. The cost of the church proper is $50,000. Organ, seating, stained-glass, heating, ventilating, plumbing and all other fixtures, $15,000.

FACTORY BUILDING, ON THE COHESIVE SYSTEM.

For description see elsewhere in this issue.

A WORKMAN'S DWELLING-HOUSE, ON THE COHESIVE SYSTEM.

For description see elsewhere in this issue.

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HOUSES FOR DR. A. WHARTON, ST. PAUL, MINN. MR. A. H. STEM, ARCHITECT, ST. PAUL, MINN.

[Additional Illustrations in the International Edition.]

A PIER OF THE PORTICO OF THE CATHEDRAL, LUCCA, ITALY.

[Gelatine Print.]

A PIER OF THE PORTICO OF THE CATHEDRAL, LUCCA, ITALY.

[Gelatine Print.]

THE HALL, CASTLE CAMPBELL, CLACKMANNAN, SCOTLAND.[1]

"EVERYBODY admires Castle Campbell. It would be difficult, indeed, to discover a more complete representative of the mountain chieftain's stronghold, as the romancists have described it in the Abruzzi or the Vosges, and Salvator and Vernet have painted it. A high and abrupt range of mountains, a precipitous rock covered with a vast and varied mass of buildings, on either side roaring torrents, seen through mysterious gulfs of frightful depth, while far off on either side stretches 'a sable, silent, solemn forest'; scarcely any of the attributes which can give interest to such a scene are wanting. The Ochils, on the slope of which the Castle stands, are at a distance, shapeless and uniform, with long table-lands and rounded summits; but their sides are in many places scooped out into precipices and gulfs. Of the wild, inaccessible spots thus created, the very best has been selected for Castle Campbell. On the front, facing the valley of the Devon, and the sides, there is, perhaps, no other Scottish fortalice so well defended by nature; and even on the rear, only approachable by crossing a high range of mountains, the access is narrow and well defendable. On approaching the Castle rock, we reach the streams which on either side tumble through the chasms at its base and meet in one, thus making the rock a peninsula. The adventurous tourist sometimes endeavors to clamber up by the channel of the more southerly stream, but the attempt is a perilous one. If not carried beyond the bounds of prudence, however, it brings him into magnificent scenery of precipice and waterfall, with the sweet overhanging trees, which give freshness and beauty to the dark fissure. Right in the face of the rock, and reaching from the bottom of the defile to the Castle wall, there is an eccentric narrow cleft, smooth as if it had been cut with a sharp knife in a soft substance. It is called Kemp's Score. Tradition ascribes it, with other geological eccentricities, to art, and also asserts that it once afforded a hiding-place for John Knox — a most unlikely service, since it is a place where a fugitive would be exposed to multitudinous dangers.

"We reach the Castle from the lower part of the torrent by a steep ascent on the surface of the smooth grass, and then we find what a lordly eagle's nest, commanding a matchless stretch of country, the great mountain chief had raised for himself. Besides the attributes of great strength and security, the fortress is not without its amenities. The mixture of symmetry with solidity in the arched roof of the hall will be noticed in the accompanying engraving. A gallery facing the rock, as well as the top of the great square tower, have been places of open-air enjoyment, and a small garden still shows an occasional crop of apples hanging from venerable, mossy trees. Some of the lower parts of the building are, or till a late period were, occupied by a shepherd and his family; and there was something to be respected in the nerves of those who could live in the these deep, dusky vaults, with the torrents roaring in the rocks beneath, and the broken, shattered and occasionally falling masses of masonry swaying in the winds above.

"It does not appear to be distinctly known at what time this mountain territory, so far separated from the others in the far West, came into the hands of the Argyle family. It was of old called the Gloume, or Gloom, and there has been much jocularity about the Castle of Gloom, in the parish of the Dollar, or Dolour, and beside the stream of Griff, or Grief. Colin, first Earl of Argyle, did not like the name, and procured an Act of Parliament in 1849 to change it to Castle Campbell. It may be given as a specimen of a species of document which, at that period, pretty frequently occurs in the statute-book:

"'Oure sourane Lorde of his Riale autorite at the desire and supplicacioun of his cousing and traist consalor Coline Erle of Ergile Lord Campbele and Lerne his Chancellare has chengeit the name of the Castell and place quhilk was callit the Gloume pertenyng to his said cousing, and in this his present Parliament makes mutacioun and changeing of the said name, and ordaynes the samen Castell to be callit in tyme to come Campbele.'

"It is not likely that the great Macallum Mhor resided so often in a place where his power was bounded by an ordinary estate, as in his island fortalice at Loch Awe, or at Inverary, where he was monarch of the surrounding territory. There are traces, however, of the occasional residence of the family here. The author of the statistical account of the parish mentions, among the seignorial obligations of the feudatories of the domain, that 'in some of the charters the vassals are taken bound to cary the wine used in the Castle from the port of Aloa, and in others to furnish horses to bring their superior and his family from Stirling.' He mentions, apparently from acquaintance with the tenures themselves, that some buildings in the neighboring village of Dollar are held by owners who, if they had to fulfil the original obligations in their titles, would have to be the hereditary bakers and butchers of the owners of the Castle, and supply coal for its fires, beer for its table, and oats for the horses of the men-at-arms.[2]

"There is one curious piece of historical evidence of the occupation of the Castle. In 1556, John Knox had lifted his ecclesiastical banner against the Queen Regent and the Pope, had gathered around him a body of followers, and held, though not yet without considerable danger, open disputations. It was then that he was desired to minister to the English Church at Geneva, and, having sent his female relations on before him, he determined to leave his friends in Scotland and accomplish the perilous journey. In the meantime, in the words of the history generally attributed to his own pen, he 'passed to the old Erle of Argyle who then was in the Castle of Campbell where he taught certain dayis. The laird of Glenurquhare being one of his auditouris, witted the said Earle of Argyle to retaine him still; but he, purposed upon his journey, wold not att that tyme stay for no requeast, adding "That if God so blessed thei small beginnings that they continued in godlyness, whensoever they pleased to command him they should find him obedient"; but said "That ones he must neadis visit that lytill flock which the wickedness of men had compelled him to leave"; and so in the month of July he left this realm and passed to France, and so to Geneva.'[3]

"We pass over to another historical epoch, nearly a century later. Cromwell had swept the King's army before him at Naseby, and the Royalist cause was doomed in England. Montrose, who proposed to bring his Highland army to England, was still beyond the Grampians, and he had to pass the well-organized forces of Baillie. In his way along the side of the Ochils to the memorable field of Kilsyth, he passed the gate of one of the stateliest of the fortresses of his hated adversary, Argyll. The opportunity was too tempting to be overcome, and, indeed, he only pursued the system of warfare adopted by both sides when he sacked and burned Castle Campbell."

THE COURT-YARD, CASTLE CAMPBELL, CLACKMANNAN, SCOTLAND.[1]

STABLES, HOLCOMBE, CHATHAM, ENG. MR. JOHN BELCHER, ARCHITECT.

ENTRANCE, HOLCOMBE, CHATHAM, ENG. MR. JOHN BELCHER, ARCHITECT.

SKETCHES IN NORMANDY.

THE sketches we reproduce were made a few months ago by Mr. Railton during a short visit to Normandy, and will suggest his style of obtaining data from which finished drawings can be made.

DESIGN FOR BOARD SCHOOL, BROMLEY, KENT, ENG. MESSRS. VACHER & HELLICAR, ARCHITECTS.

THESE schools, to hold 600 children, were competed for by the local architects. The design was sent in with others illustrated under the motto "Bromley," but the professional assessor excluded it and placed another design first. A protest was made, and disputes having arisen — raised by one of the other competitors, who considered he had not been fairly treated — the Board were induced to consult the Council of the Royal Institute of British Architects, who ruled that the consulting architect was as much bound, in making his award, by the instruction issued with his concurrence as were the competing architects, and, therefore, the design placed first should not have been thus placed. The Board, following further advice, submitted the designs to Mr. Norman Shaw, R. A. There was a clause restricting any buildings behind line *A A* to a maximum height of twenty feet to the highest feature. Messrs. Vacher & Hellicar, the authors of the design "Bromley," have been appointed the Board's architects for these schools.

PARISH ROOM AND SCHOOL, CHARLETON, DEVON, ENG. MR. F. T. COMMIN, ARCHITECT, EXETER, ENG.

THIS building was recently completed, and has been erected from the designs.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE POPULAR IDEA OF ARCHITECTS' INCOMES.

BOSTON, MASS., February 17, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — As a commentary upon some recent remarks in your journal about mistaken notions regarding the incomes of architects, the following paragraph from an article in the Boston *Transcript* of

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," [1845] by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

[2] New Stat. Account, Clackmannan, 108.

[3] The Works of John Knox, 1, 254.

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February 15 may be of interest. The author kindly gives the profession double the fee which custom allows, and three or four times what is often forthcoming. This and the unkind criticism of the architect's performance of duties, some of which are imposed upon him in entire disregard of wise foreign regulations which the writer extols, must, it would seem, proceed only from ignorance or the desire to make a point by misrepresentation.

"Four years of technical study and the possession of a diploma must precede any constructive work by a French architect; he is held responsible for twenty years for accidents occurring in buildings he has erected. He or his representative is on the ground during the entire period of construction. With us, he alone is the judge of his qualification, and his responsibility usually ends with the payment of ten per cent for *not* superintending the work."

Yours, respectfully, A. Clinton Brackett.

ABATTOIRS.

Philadelphia, Pa., February 10, 1890.

To the Editors of the American Architect:

Dear Sirs, — Will you please, in your next issue, direct me to any source of information in regard to abattoirs as erected in Cincinnati, Chicago and other cities of the West.

Respectfully yours, A Subscriber.

[We cannot give any information as to Western abattoirs, but the pamphlet describing the Brighton, Mass., abattoir, published by the Massachusetts State Board of Health in 1878, may be of assistance. — Eds. American Architect.]

NOTES AND CLIPPINGS

The Prison-Ship Martyrs' Monument. — Representative Spinola has been instructed by the House Committee on Military Affairs to report favorably to the House his bill appropriating $100,000 for the erection of a monument to the prison-ship martyrs, in Brooklyn. — *New York Tribune.*

Church Restoring by Lottery. — It is not often that so interesting a lottery is announced as one which is to be drawn in Munich on the 25th of this month. The money that will be raised is to be applied to the restoration of the Church of St. Sebaldus, in Nuremberg, which is one of the most interesting buildings in Germany. Among its treasures is Peter Vischer's masterpiece, the "Tomb of St. Sebald." — *New York Commercial Advertiser.*

Decision Against the "Trolley" System. — On February 12, Judge Taft, of the Superior Court sitting in Cincinnati, decided the case of the Telephone Company against the Mount Auburn Electric Street Railroad Company. The Telephone Company asked for an injunction restraining the defendants from using the single trolley system, on the ground that it interfered with the operation of telephone wires. The court decided in favor of the Telephone Company, granting the injunction, but allowing the Street Railroad Company six months in which to make the necessary changes. It seems to us that a similar decision in Boston must be made sooner or later.

The Queen of Greece and an Electric Wire. — Electric wires are no respectors of persons, and it was only by a piece of dumb luck that the Queen of Greece recently escaped instant death when one became detached from its fastenings and fell upon her as she was walking in the palace grounds. By great good fortune the current was at the time shut off, but the wire encircled her in such a way that it took her attendants several minutes to release her from it, and hardly had it been cast loose when the high tension current was turned on and made itself manifest in the form of long sparks. The sensations of the manager of the plant when he learned of the occurrence may be imagined. — *Fire and Water.*

The Tunnel Under the St. Clair. — Six hundred men are now digging the railroad tunnel under the St. Clair River, at Port Huron, at the rate of fifteen feet each day. More than 1,200 feet of the tunnel proper is now ready for trains on the Michigan side and 900 on the Canadian. The remaining 4,000 feet will be finished at a wonderfully rapid rate, considering the nature of the work. The tunnel is over 6,000 feet long. The approaches are equally long, so that the entire length will be more than two miles. Of this distance 2,310 feet are under the river, 2,390 feet on the Michigan land side and 2,100 on the Canadian. The grade is one foot to every fifty, except under the river bottom, where it is substantially level. It is an iron-cylinder tunnel — the only one of the kind in the country. There is neither brick nor stone used in this construction. Neither are there any stays or supports — simply a mammoth iron tube built in sections underground. It is designed for a single track. Electric-lights make it as light as day, air-engines keep the atmosphere as healthy inside as above, and steam-pipes hold the temperature at the proper point. It is as dry as a street in summer, and the disagreeable features common to subaqueous work are entirely absent. Work is pushed from both ends. The method of construction is simple. A great cylinder, weighing more than sixty tons, twenty feet in diameter and sixteen feet long, is driven into the blue clay, which constitutes the entire bottom of the river, by the use of hydraulic power, with as much ease as cakes of soap can be carved out of a general mass. Inside this cylinder, which is called a shield, twenty-two men are at work removing the dirt. As fast as the shield is pushed forward, which is about two feet at a time, the clay thus brought inside the shield is dug out to the edge of the great cylinder. Then the hydraulic jacks are again started, and slowly, but irresistibly the immense iron tube moves another two feet into the solid earth ahead of it. Each jack has a power of 3,000 tons, and the combined power behind the shield is more than 400,000 tons. Another ring of iron-lining is put into place, and each foot of tunnel is ready for track-laying as fast as the work progresses. There is no mason-work, as already stated, and when done the tunnel will practically be a continuous iron tube twenty feet in diameter and nearly 7,000 feet long. The iron plates that form the lining are of such curvature and length that any thirteen of them, with a small key piece, will make a circle of twenty feet in diameter. The edges and ends are turned up, each piece being bolted by a dozen large bolts to its neighbor. Each one is eighteen inches wide and weighs as near 1,000 pounds as the foundries can make them. — *Boston Transcript.*

TRADE SURVEYS

It is now about twenty years since the great agitation in favor of internal water-way improvements upon a large scale. The senatorial committee which at that time listened to the popular demand recommended that as much as $150,000,000 could be judiciously expended in the construction of canals, the improvement of rivers and the general utilization of the water-ways of the country for the purposes of commerce. Railroad influences were credited with destroying the budding scheme to divert this large amount of public money in this direction. Then followed the granger movement, with results which have never yet been satisfactory to the agricultural or commercial interests of the interior. On the heels of this agitation came the Interstate Commerce Law, with which railroad managers, railroad boards and legislatures have been wrestling ever since. Despite the obstacles encountered, a great deal of progress has been made in the removal of difficulties and injustice. Moderate improvements have been made from time to time, and now a large number of schemes are about to be pushed. The shipment of 5,000 tons of pig-iron from Sheffield, Ala., to Pittsburgh by water, is one of the first results growing out of this long agitation. Engineers are now at work mapping out the course of a canal to connect the Ohio River and Lake Erie. The water-ways of the Northwest are to be greatly improved as soon as the proper agencies, political and otherwise, can be organized for their prosecution. The Hennepin Canal scheme is on its feet; Chicago expects to soon have freer intercourse with the Northwest. The River Freight Line Navigation Company is another one of these schemes growing out of this long agitation; its object is to run 60 steamships between Omaha and Pittsburgh. This is not a fairy tale, although it reads like one. The capital stock of the company is $5,000,000, divided into 50,000 shares. It is proposed to carry freight at a minimum rate of 15 cents per 100 pounds for all consignments of 1,000 pounds or more. It is intended to reach the entire Southwest, in time, by other lines, and minerals, iron, lumber and other Southern products will be carried up the Ohio Valley and the valley of the Missouri. The time has come when such a scheme as this can be successfully carried out. The necessity of rushing heavy freights fifteen to twenty miles an hour is not so urgent as it was formerly. Less speed will now answer; shippers will only have to start a little sooner. Three ship-yards are now being built along the Lakes, one of them at Chicago, with a capacity of twelve large lake vessels at one time. Seven large boats are under contract at Pittsburgh for the South American trade, and there are facilities there to meet the heavy demands likely soon to be made for river craft. In fact, a new departure is in order; it means that the people are gradually edging themselves into a position where they will be able to free themselves from their almost exclusive dependence upon railroad transportation. Looking at the subject from a reasonable and business-like standpoint, there is no reason why a large proportion of the heavy freights now moved at great expense and risk by rail could not as well, and much more cheaply, be moved by water. The development in this direction will not interfere with the prosperity of the railroads, will not decrease the value of their properties, nor, in reality, deprive them of a ton of freight. The growth of the country and the necessities for increased commercial intercourse demand this departure. As railroad construction led to the building of towns along the lines of road and the development of contiguous territory, so will the development and utilization of our interior water-ways influence the country's growth. It is well to note the weekly and monthly ups and downs of trade and commerce, to catch the meaning of the movements that are in progress. Much of the future development of the United States will be along the larger rivers, and the smaller ones which are to be made navigable. New towns will spring up and grow to be cities, owing to the abundant and cheap transportation facilities which the contemplated improvements will establish. There will be a fresh decentralization of industries; a development of industrial activity in new lines, opening up fresh opportunities for labor, enterprise and capital which now remain inactive, largely owing to the entanglements of our railway managements, and the deleterious influences which these difficulties exert, directly and indirectly, upon the little industries which require special and careful fostering. The general business interests of the country are gathering strength; in the opinion of financiers, railway managers and heavy manufacturers, we are entering the most active business year we have ever enjoyed. Money, while equal to the requirements which exist on the broad commercial highways, is not in sufficient supply to meet the demands of the by-paths and remote places. There are tens of thousands of little business men suffering for want of money, which a wise and beneficent financial system would and should provide. The cries of these diminutive business interests are not heard. The influences controlling legislation and directing the great energies of the country are opposed to what might be regarded as schemes of benevolence so far as providing sufficient currency to meet the demands of far-off, isolated districts are concerned. Even the best business men and moneyed men of the East do not properly appreciate the force of public opinion in the West, demanding that more attention be given to the business and commercial requirements of that section. The question of farm mortgages is now attracting the attention of Congress. When that subject is thoroughly investigated, it is probable that the public sentiment resulting will lead to some remedial measures. The business men of the West have as much to gain by an abundant supply of money, well distributed, as they have to gain by the irrigation of their prairies through the economic distribution of the rainfall of the Rocky Mountain region.

S. J. Parkhill & Co., Printers, Boston.

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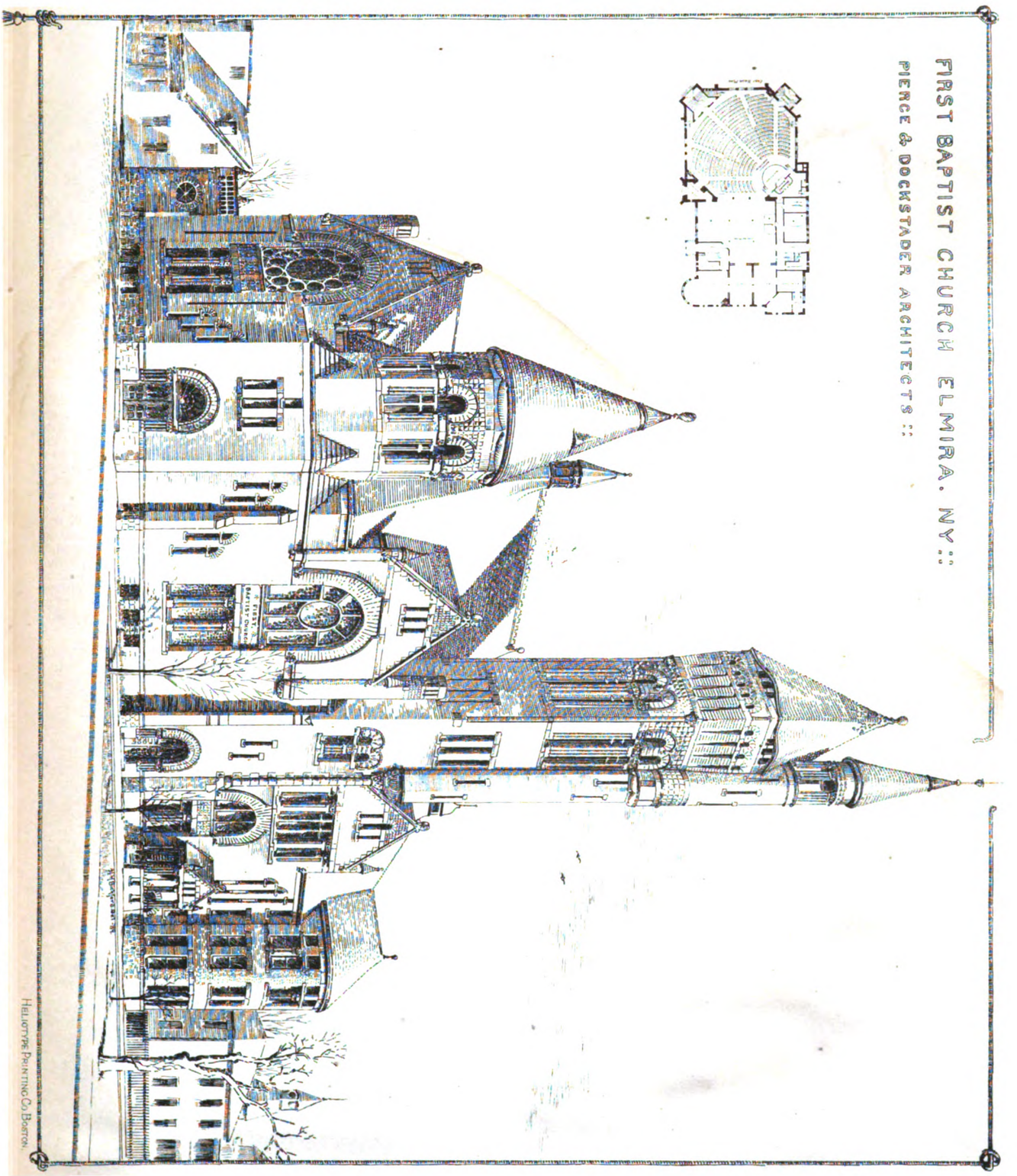

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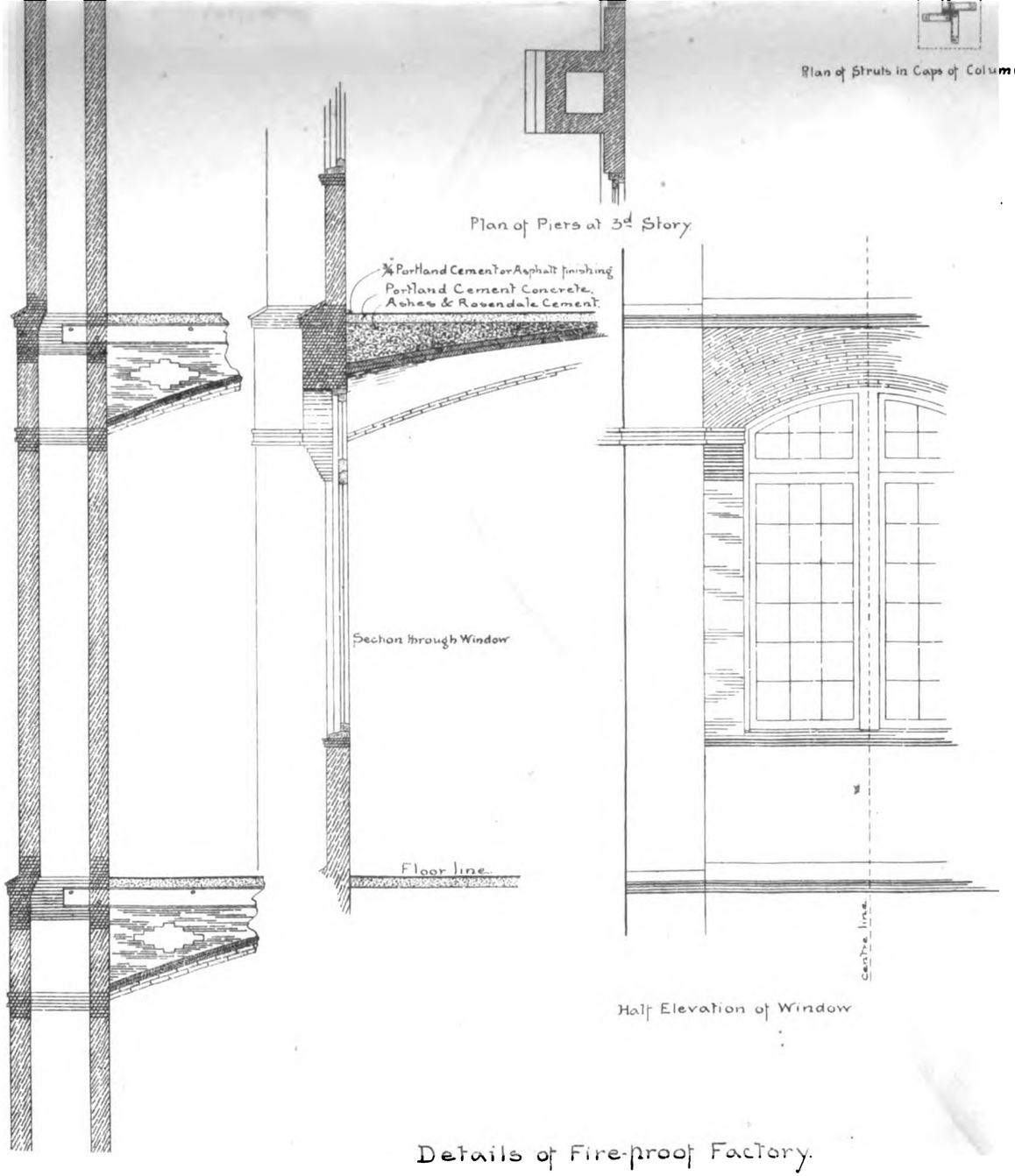
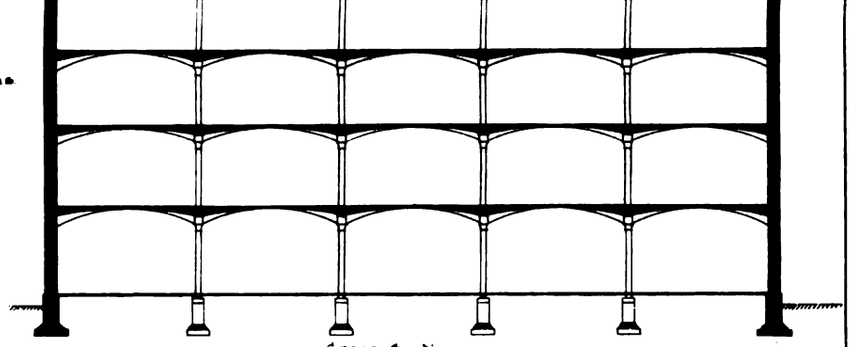
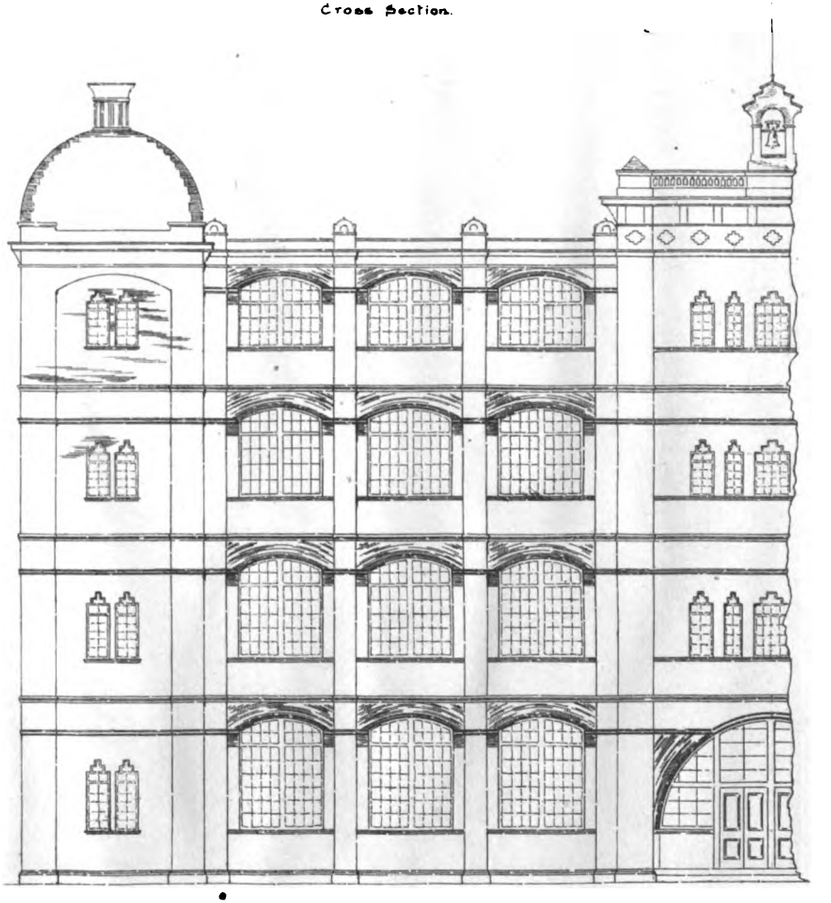

Plan of Struts in Caps of Columns.
Plan of Piers at 3d Story.
¾ Portland Cement or Asphalt finishing
Portland Cement Concrete.
Ashes & Rosendale Cement.
Section through Window
Floor line
Centre line.

Half Elevation of Window



Cross Section.



Part Front Elevation.

Details of Fire-proof Factory.

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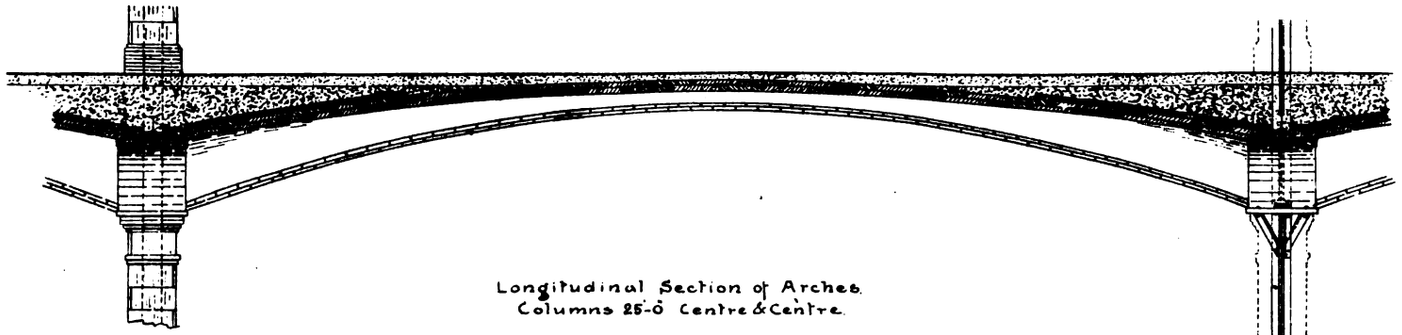
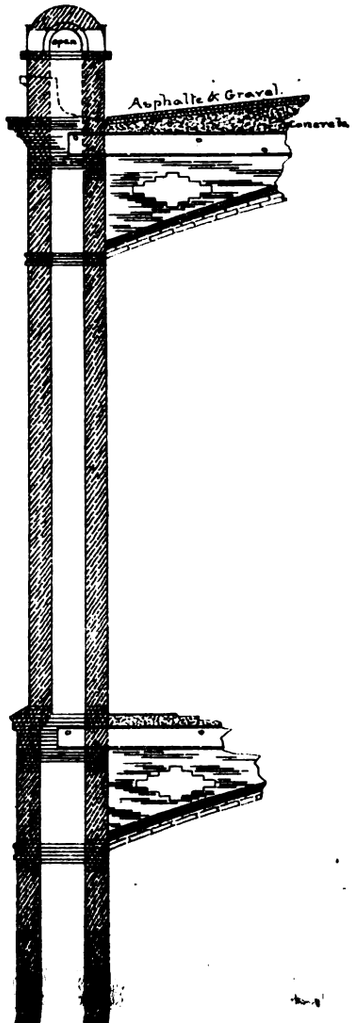
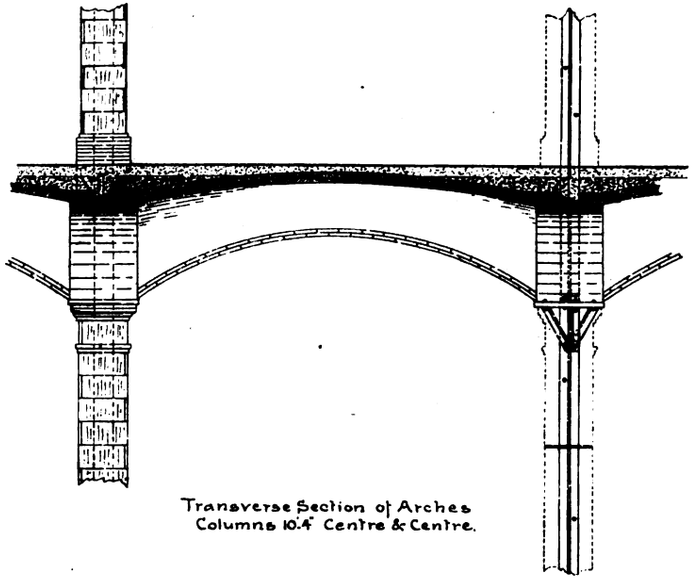


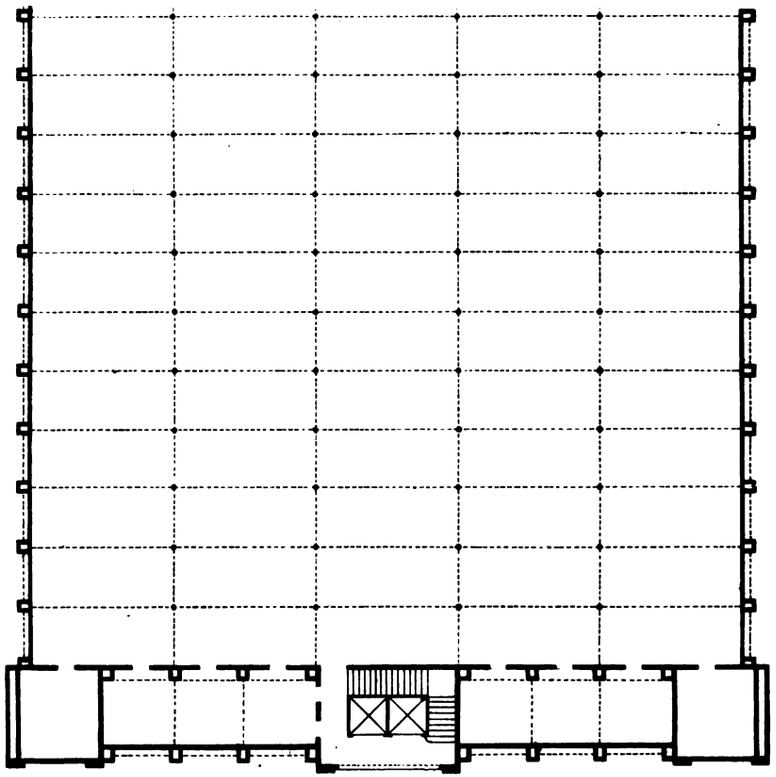
Longitudinal Section of Arches.
Columns 25-0 Centre & Centre.

Fire-proof Factory.





Transverse Section of Arches
Columns 10.4' Centre & Centre.



Plan.

Plan of Columns.

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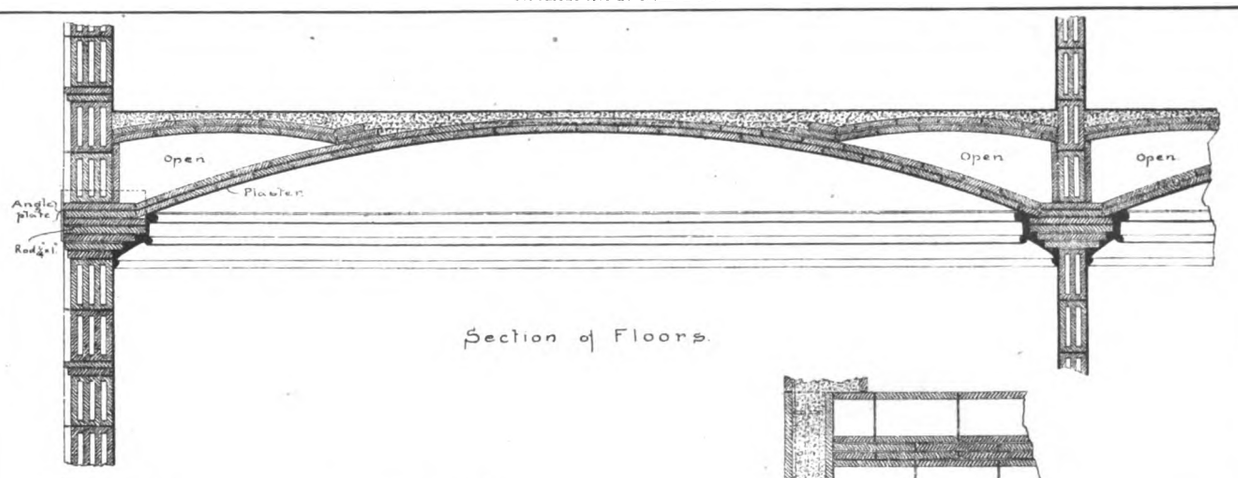
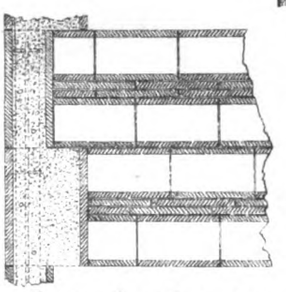
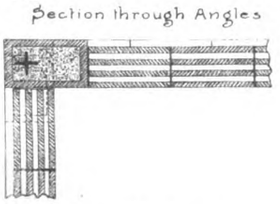


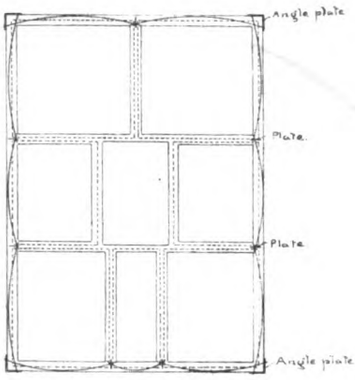
Section of Floors.



Section through Angles

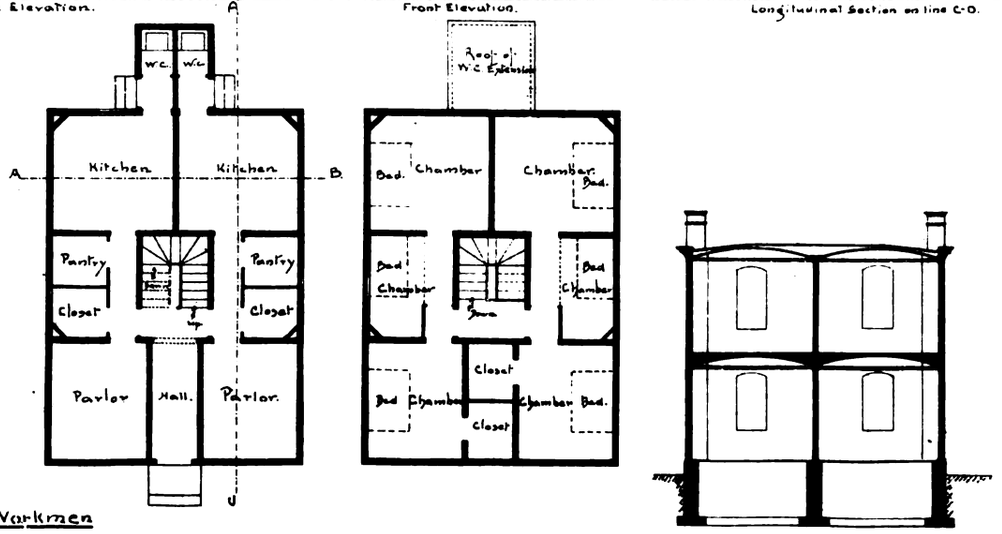


Plan at Angles.



Plan
showing skewbacks & tie rods
Scale 1/8 in Foot

Details of
Fire-proof House for Workmen
on the Cohesive System



House for Workmen

First Story Plan.

Second Story Plan.

Cross Section on line A-B

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American Architect and B

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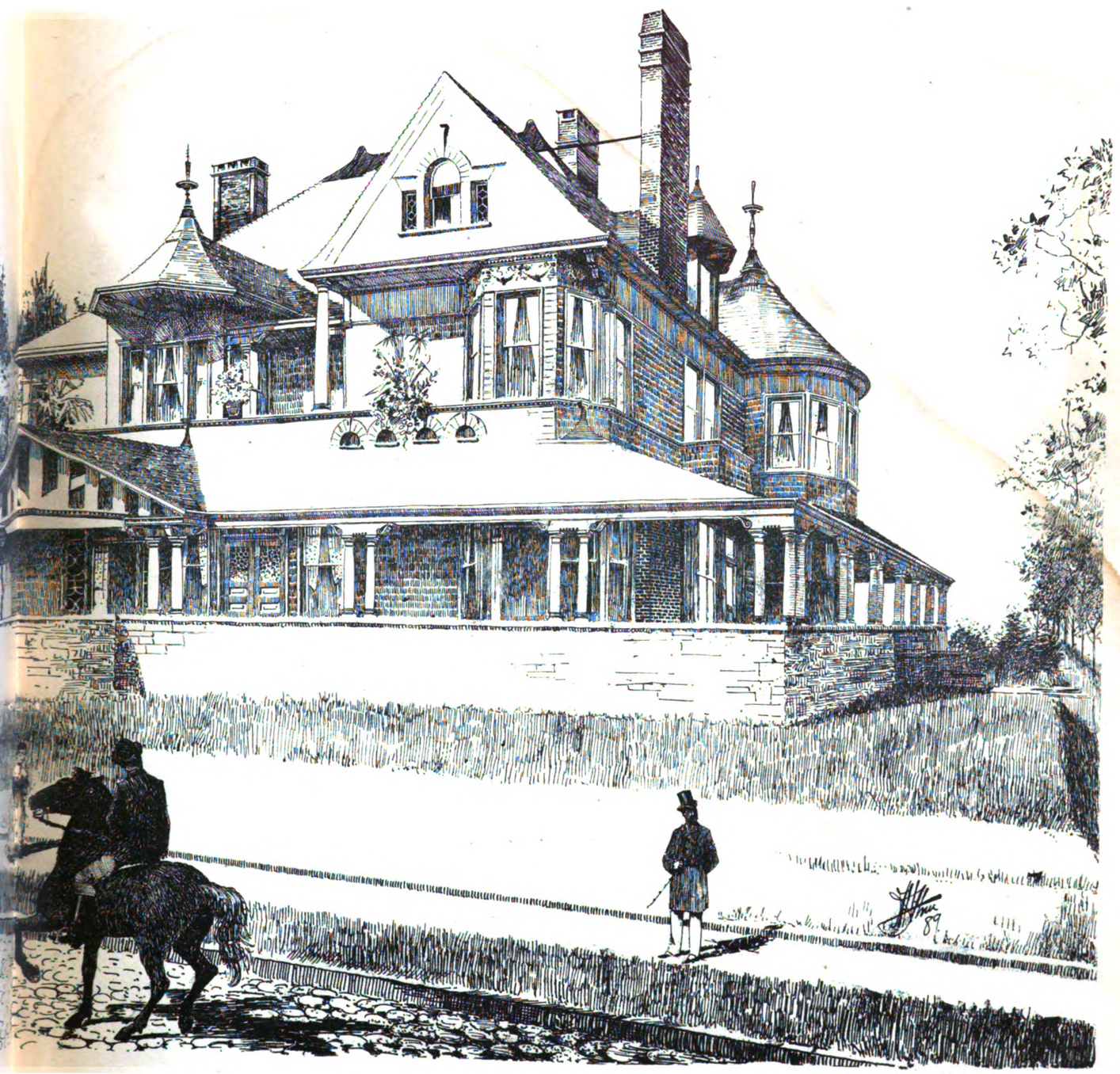

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MARCH 1, 1890.

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THE Massachusetts Legislature, which is well known for its benevolent disposition, heard, in 1888, that children in school-houses did not have all the fresh air to breathe that would be good for them, and forthwith passed a law, commanding that "Every public building and every school-house shall be ventilated in such a proper manner that the air shall not become so exhausted as to be injurious to the health of the persons present therein." The enforcement of this decree was referred to the District Police, and the legislators, conscious that they had deserved well of their constituents, turned their attention again to more important business. Fortunately for the Massachusetts children, the Chief of the District Police is a man who conceives it to be his duty to enforce laws, instead of maintaining the urbane unwillingness to believe that any one could be thinking of violating them, which renders certain officials so popular, and, in enforcing them, he takes pains to learn something about the subject to which they relate, so as to be able to carry out his mission fairly and efficiently. Hence it came about that, instead of buying an interest in a "sewer-gas cremator" patent, and ordering that a three-quarter-inch pipe should be carried from each privy vault to the furnace-grate, he put his inspectors in the way of finding out what was the proper quantity of fresh air to be supplied per hour to school-children, and of applying anemometers and carbonic-acid tests to see whether they got it, and then sent them out to examine the school-houses throughout the State. As architects can well imagine, the result of the investigation would have been, in some cases, amusing, if it had not also been tragical. On the whole, the ventilation of the school-houses seems, from the printed report, to have been creditable to the State, and there are indications of a popular knowledge of the importance of fresh air, and a perception of the methods of getting it, which hardly existed ten years ago; but there are also plenty of illustrations of the stolid, brutal ignorance of the physical needs of children, and indifference to their sufferings, which have by no means yet died out among school-committees and town officers.

AMONG the examples of criminal ignorance and stupidity in school-building, the worst, perhaps, is furnished by a case in Salem, where a four-room school-house, accommodating one hundred and sixty pupils, was found to have been planned with privies in the basement, the vaults of which were "ventilated" by two galvanized-iron pipes, one four inches and the other six inches in diameter, carried to the chimney. The rooms above were also "ventilated" by means of registers at floor and ceiling, opening into the same chimney, and, apparently, into the same flue. It is hardly necessary to say that even the teachers, who, it must be remembered, in most Massachusetts towns are elected annually, and know that their position depends upon the delightful perfection which they discover in everything that the school-committee provides for them, "perceived a foul atmosphere" at certain times in the rooms, but it was not until seven cases of diphtheria had occurred among the pupils, with four deaths, that attention began to be called to the injudiciousness of ventilating, by diffusion, the privy-vaults into the class-rooms, and the school was ordered closed until changes were made. In another large and important school-house, built in 1872, the inspector was apparently startled at finding the air in the basement charged with fifty parts in ten thousand of carbonic acid, and it turned out that the privies were in a building about thirty feet away from the main school-house, but that, not to lose entirely the charm of their presence, a well had been dug in the school-house cellar, which undoubtedly received the drainage from the vaults. For some time the children in the school were given water from this well to drink, but a few years ago the stench from it became insupportable, and it was filled up. Though lost to view, the well took care that it should not be forgotten, by sending forth an aroma, which pervaded, more or less, the building. The arrangements for getting rid of this healthful atmosphere were as judicious as those by which it was produced. Three "ventilating-ducts" were built in the brick walls, communicating, by tortuous wooden boxes, with the roof. There were openings from the top of the rooms into these "ducts," but, as they were not warmed, nor was any inducement offered them to exercise any "ductile" power, they declined to do so, just as any other "duct" of the kind does under similar circumstances. One is hardly surprised to find that boards were nailed over the "ventilating" outlets, to save fuel, as was the case in other instances. In several school-houses, the so-called "ventilators" opened from the rooms into a garret, or other entirely enclosed spaces, and, of course, there was no movement of air whatever through them; but even the pretence of ventilating openings was in several buildings boldly abandoned. In one large school-house, with an average attendance of more than three hundred children, there was absolutely no provision for ventilation except by the windows and doors. Even the furnaces, three of which were used, had no fresh-air supply, but gathered the air which descended from the upper stories to the cellar floor, warmed it up, and delivered it again to the rooms above. The cellar was used to store coal, wood, ashes and the sweepings from the school-rooms. The floor was flooded with water after all heavy rain-storms, and the wood-pile stood over a bed of wet, rotten rubbish, which had been accumulating for years. The same state of things was found in another large school-house in the same town, and the inspector ordered it remedied. Thereupon arose a storm of indignation in the town. "A leading medical practitioner" got up in town-meeting, and said that the two school-houses in question were "well ventilated"; that there "had been more sickness among school-children from too much ventilation than from too little," and that the requirements were "absurd."

IN the death of Mr. W. J. McAlpine, the country loses perhaps its most eminent civil engineer, as well as one whose name was particularly familiar to architects. Mr. McAlpine was born in New York, in 1812, and educated in the city schools. He seems to have had a remarkable turn for civil engineering, and, while very young for so responsible a post, was employed upon the Erie Canal as one of the chief engineers, remaining in charge of the eastern division of the canal till 1846, when he resigned, to design and carry out the dry-docks at the Brooklyn Navy Yard, for the United States Government. In 1852, he was elected State Engineer of New York, and, two years later, became State Railroad Commissioner. He was connected for a time with the Erie Railroad, as chief engineer, and acting President. During the war, he had charge, for the Federal Government, of the railroads under military occupation in the Southern States. By this time, he had attained a very high reputation in his profession, both at home and abroad, and was requested, in 1870, by the Emperor of Austria, to submit designs for the improvement of the cataracts of the Danube. According to the New York *Evening Post*, to which we are indebted for a very

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interesting account of his life, his plans were accepted, but we think that they are not yet fully carried out. When the Capitol at Albany was begun, Mr. McAlpine was appointed consulting engineer and general superintendent, and made some very skilful and thorough tests of the foundation. Later, he was chief engineer of the unfortunate Arcade Railroad, and, nearly to the day of his death, was active in professional work. Naturally, his employment for the last ten or twelve years was mainly as a consulting engineer, and there was no one, perhaps, whose opinion was so highly valued, and so frequently sought. Although ardent in the pursuit of his profession, both in practice and theory, he cared little for mere money-making, and his reputation for perfect integrity and honesty was perhaps increased by the modesty of his fortune.

OUR readers probably know that Signor Brentano, the young winner of the great competition for the completion of the Cathedral of Milan, died recently in Milan, before anything had been done toward the execution of his design. In fact, he had only just begun the construction of a model in wood, intended to afford him better opportunity for studying the effects indicated by his sketches, when he was seized with typhoid fever, which soon proved fatal. Whether his design can be, or will be, carried out, seems now somewhat problematical. According to Signor Melani, who writes on the matter to the *Builder*, Brentano's model is now being completed, in accordance with the designer's drawings, and there would be no great difficulty in keeping closely to the outline and disposition already determined upon, but the Cathedral officials have, so far, only the Togni bequest, amounting to about one hundred and seventy thousand dollars, to go toward paying the bills for an undertaking, the cost of which is estimated at two millions; and the lack of Brentano's personal influence, with, perhaps, the jealousies which are sure to be excited by the appointment of his successor, may postpone indefinitely the carrying-out of the project. By the terms of the Togni bequest, which dates from 1884, the money must be wholly or partly used within twenty years for the work on the Cathedral façade, or the gift lapses to another charity, but some way may be found for retaining the sum, which is, after all, not large in proportion to the whole amount necessary. Personally, as Signor Melani writes, Brentano was a man of very modest disposition, irreproachable in character, and accustomed rather to the life of a fastidious and well-bred young man of rank, than to that of a professional artist. Notwithstanding his elegant and luxurious tastes, however, he was a devoted student. Even while a pupil at the Polytechnic School at Milan, he gained much credit by his sketches of architectural subjects; and when, much to his own surprise, he was selected to be one of the participants in the second competition for the Cathedral façade, instead of imagining himself to be the greatest artist living, he went immediately to Germany, to study Gothic architecture to the best advantage, and, after examining the best original examples, entered the office of Baron Hasenauer, the celebrated architect of the Museum of Fine Arts, and many other buildings, at Vienna, where he remained for several months, for the sake of gaining a knowledge of the principles of Gothic work from so competent a master. All this well-directed work bore fruit, and his final design immediately received the votes of twelve out of the fourteen judges. The excitement and anxiety of the contest appears to have been too much for a constitution naturally delicate, and his friends have for some time been dreading an event which has made the winner of the competition the fourth of the competitors, under thirty years of age, who has died since the first sketches were submitted. The first was the lamented Ciaghin, of Saint-Petersburg, who was selected for the second competition, but did not live to finish his plans. The next was Tabea, of Venice, a man of great ability, and the third was Raffaele Cattaneo, who will be remembered as one of the architects engaged upon Ongania's splendid publication on the church of S. Mark at Venice.

A CASE of an architect's responsibility is reported from Paris which has its moral for us. A certain Bautin built a small shop in that city. Bautin was a frugal soul, and, while his two brothers-in-law were digging the cellar, he got an architect, named S., to go with him to his father-in-law, Denis, who dealt in second-hand materials, to pick out some beams and girders suitable for the first floor. The beams were sent and put in position, and, after the floor was on, Bautin engaged the architect to look after the rest of the work. The shop was finished, and rented for a "crêmerie." Soon afterward, the proprietress of the "crêmerie," Madame Dufrèche, with a customer, Mademoiselle Steller, fell through the floor, in consequence, as was proved, of the rottenness of the beams, and were severely bruised. Thereupon they brought suit for damages against the architect and the owner, and a criminal action was also commenced against the same parties. All the parties appeared before the court, and Denis, who sold the rotten sticks, explained that he furnished some cheap lumber to accommodate his son-in-law, but that neither the latter nor himself knew how to distinguish rotten timber; that, further, the architect and the contractor came to his place and picked out the sticks. Bautin, of course, protested that he knew nothing about construction, and left everything to his architect, under the well-known rule by which, if an owner chooses to use cheap and inferior material, the architect, unless he protests against it vigorously at the time, is bound to pay out of his own pocket, later, the difference in value between the bad material and that of good quality, which he ought to have insisted on having used. The contractor did not make his appearance at all, and the court condemned the wretched architect to pay twenty dollars, and Bautin ten dollars fine, on account of the rotten timber of the latter's father-in-law; and the two were ordered to pay "*solidairement*" three hundred and sixty dollars damages to the two injured ladies, besides costs.

A NEW fashion has set in in Paris, which will probably soon be imported into this country, and consists of nothing less than the holding of bull-fights of a rather mild kind, but resembling those of Spain in everything except the sanguinary murder of half-a-dozen horses and two or three bulls, which usually give spice to such entertainments in the Peninsula. The French police supervision, which is, of course, very rigid in Paris, absolutely forbids the killing of either horses or bulls in the arena, and, although the most celebrated Spanish matadors, Lazartijo, Angel Pastor and the great Frascuelo himself, appear in the Parisian ring, they are obliged to content themselves with dexterous dodging of the bull's attacks and a pretended sword-thrust in the fatal spot, just back of the ears, which is, however, only allowed just to penetrate the skin. The other paraphernalia of the *plaza de toros* are, however, there. The bandarilleros chase the bull about, and plant little arrows in him, and vault nimbly over the fender when his horns get uncomfortably close, the picadors touch him with their lances, but the affair becomes, instead of a repulsive and cruel spectacle, rather an interesting gymnastic exhibition, and as such is highly appreciated by the Parisians. According to *La Semaine des Constructeurs*, a variety in the entertainment might be, and, some years ago, was introduced by a company of bull-fighters from the Camargne, the flat country on the Mediterranean coast, near Marseilles. These men, who often exhibit their performances in the ruined arenas of Nîmes and Arles, devote themselves to the athletic side of their profession, and acquire immense dexterity. One set, known as the "*écarteurs*," stand waiting for the bull, and, as he rushes upon them, dodge him by a dexterous pirouette. Another set, called "*sauteurs*," carry long poles, and stand, coolly leaning on the poles, awaiting the bull's attack. His dash is always made in a straight line, and, as he plunges at them, they seize the moment, just before he reaches them, to rise in the air by a dexterous vault with the pole, and, flying over his head, come down behind him, while he continues his furious course. Another set of "*sauteurs*," stronger and more skilful still, leap into the air, without any pole, and allow the bull to pass under them, descending neatly on the tips of their toes behind him. For variety, these acrobats often wrap their legs in their cloaks, or tie their ankles together with a handkerchief, before taking their jump.

FOR a long time it has seemed as if it were hardly possible to avoid this year a very serious struggle in the building trades. Masters and men have confronted the situation for months, and have on both sides taken steps to perfect their organizations, so, if the struggle does come, it may be long and serious. The success of the strike against Morton & Chesley in New York will make the freestone-cutters in Boston hopeful of gaining their point, while the attitude of the master stone-cutters promises to make the threatened lock-out an effective one — until the selfish interest of some individual puts an end to it.

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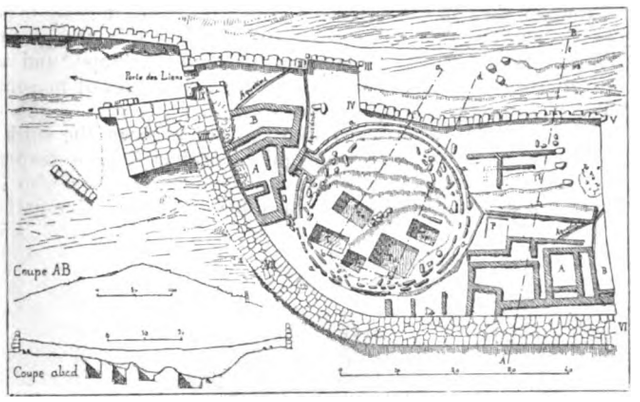
FUNERARY ARCHITECTURE.[1]—III.

THE GREEKS.



Tombs at Mycenæ.

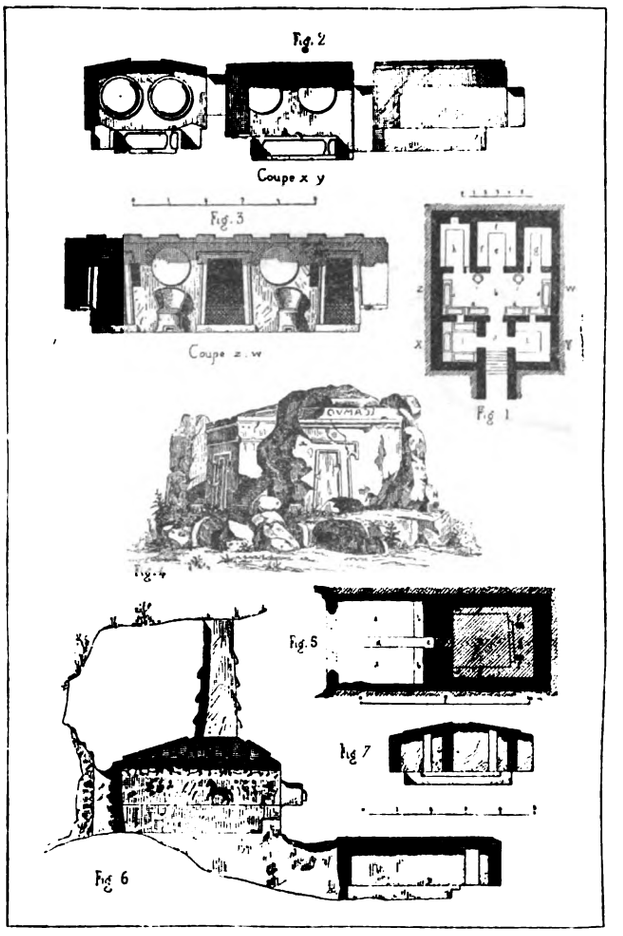
MORE or less stately descriptions of the primitive Greek tombs have come down to us in the works of ancient authors.

So far as can be determined, they were mainly tumuli, of greater or less importance, and more or less decorated, covering the bodies or the ashes of distinguished personages. The recent discoveries of Dr. Schliemann at Mycenæ have thrown much new light on questions concerning the burial-places of the heroic period. Whether or not the five tombs found by him at the centre of the Agora were the burial-places of Agamemnon and his family, they nevertheless possess peculiarities of exceptional interest. The Agora, the circular enclosure of which is formed by a double row of upright slabs, like the Celtic cromlechs, lies in the Acropolis near the Pelasgic walls and the Lion-Gate. It contains five tombs, which are nothing more than quadrangular openings hewn into the rock. The situation of the graves was indicated by stelæ, either plain or adorned with extraordinarily archiac sculptures, as well as by a funeral altar. The bodies seem to have been partially incinerated on the spot. The learned excavator had the good fortune to unearth near them an invaluable collection of gold ornaments of very beautiful workmanship, and notably several gold masks which were placed over the faces of the dead; all these articles are remarkable for the purity of their style.

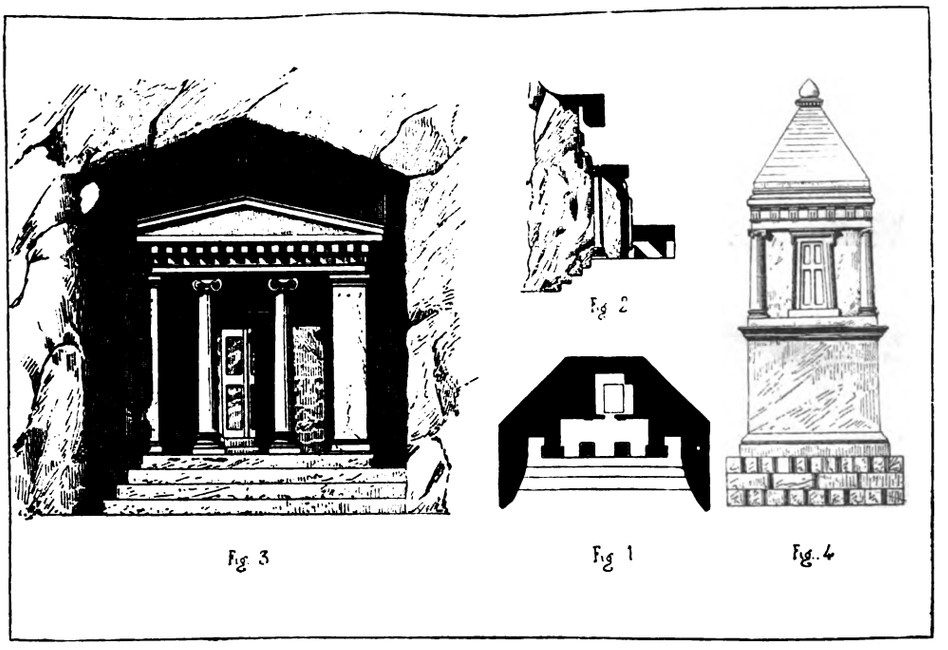
Among the peninsular Greeks the tombs were greatly varied in form; usually, however, a simple stela, terminating above as an antefix, is found raised over the grave. Abundant examples of stelæ of this kind are to be seen in European museums; they are for the most part wonderful models of decorative carving [Various Stelæ, Figures 5, 6, 7, 8, 9, 10]. Certain other tombs terminate in a pediment and appear in low-relief; others still are nothing more than diminutive reductions of the façade of a temple.

Many of the tombs seem to have been ædiculæ composed of four columns supporting a roof, under which stood a statue. We believe that no example of these now exists in Greece. Burials were always made outside of the cities. The few exceptions to the rule were in favor of especially distinguished citizens.

Very beautiful specimens of funerary architecture have come down to us from the Greek colonies or from the peoples subjected to Greek influence. We give, as examples, the well-known rock-cut tomb of Telmissus in Syria (Figures 1, 2, 3), and the no less celebrated Tomb of Theron in the neighborhood of Agrigentum, after the restoration of Hittorf (Figure 4). In the first of these, the cutting of the various details of the false door under the porch exhibits the same painstaking to imitate wood construction which we have already remarked among the Syrians; a similar attempt likewise appears in the unusual size of the dentils, which have the look of rafter-ends.



Etruscan Tombs.



Tombs at Telmissus and Theron.

THE ETRUSCANS.

The only architectural remains of the Etruscans are their tombs. The Romans, aided by time, swept away every other

[1] From the French of Pierre Benouville in Planat's "*Encyclopédie de l' Architecture et de la Construction.*" Continued from No. 739, page 118.

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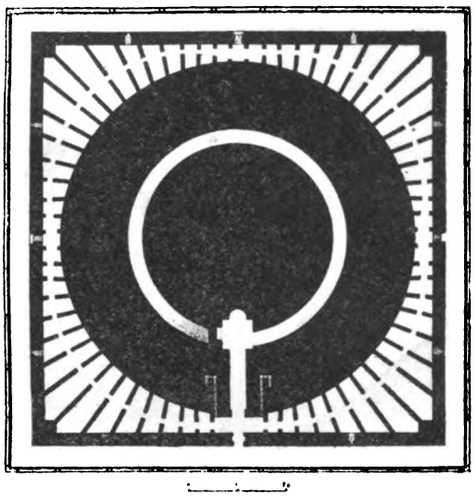
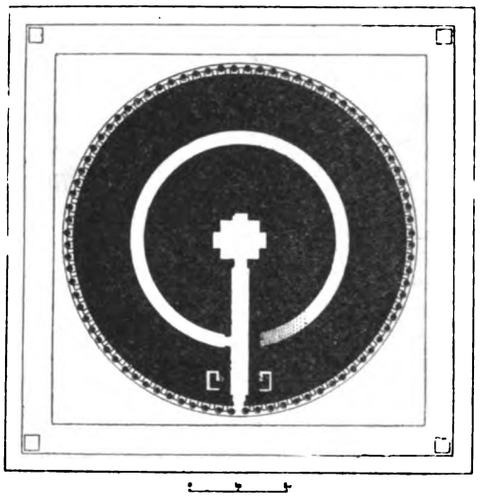
Etruscan construction. Although their sepulchres are all rock-hewn, they present a considerable variety of types. This fact is traceable not only to the varying character of the soil, but also to the Greek or Asiatic influences brought to bear upon the art of this people whose civilization went down before the waves of Roman invasion.

The tombs of Castel d'Asso, though cut in the limestone, form almost detached ædiculæ; they adhere to the rocky mass only by the posterior portion. The main part of the house-like structure is of rectangular shape, with strongly sloping walls; it terminates with a slightly projecting cornice and is surmounted by a pyramidion. (Nothing but the framework were doubtless intended to accommodate the funeral furniture. At Corneto (Tarquinii) genuine conical tumuli with basements of masonry still exist. The entrance in all cases is through a door in the basement which communicates by means of a stairway with burial-chambers excavated in the ground. These chambers are rectangular or oval in shape, and are covered with ceilings or vaults of corbelled courses of masonry. The bodies were merely laid on benches.

Figures 5, 6, 7, borrowed like the others from the work of Gailhabaud, represent a tomb quite peculiar in one respect: the burial-chamber is preceded by another chamber, also cut in the rock, and doubtless designed for commemorative gather-



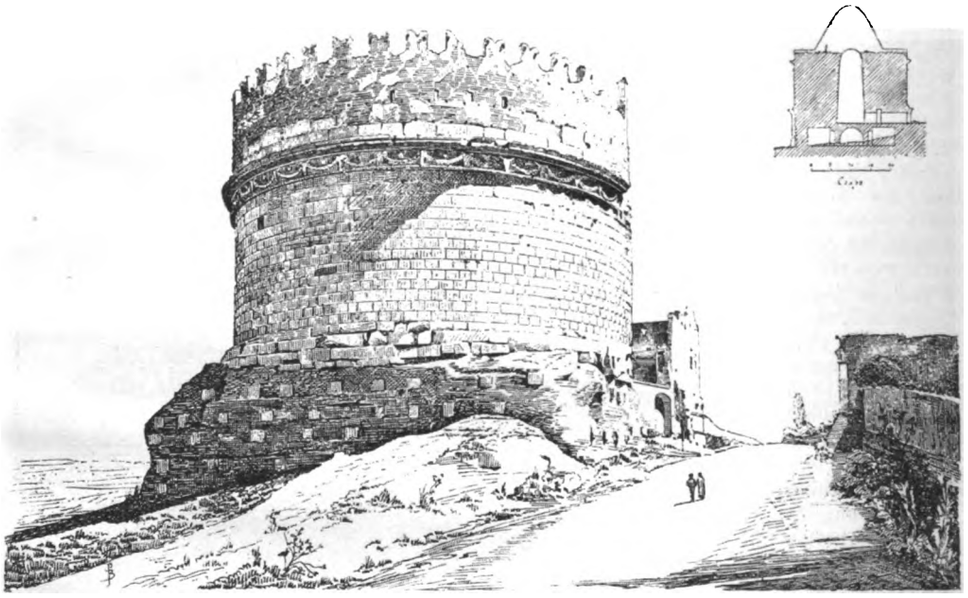
Tomb of Hadrian. Plan at Lower Level.



Tomb of Hadrian. Plan at a Higher Level.

now remains of the greater part of these crowns). On the anterior face is a false door with slanting jambs; the casing is formed by a simple moulding the *crossettes* of which are clearly marked. Beneath this door was the real entrance which was hidden by earth transported there for the purpose; it gave access to a circular or elliptical room, which contained the sarcophagi, or, more correctly speaking, a series of coffins hewn out of the rocky mass. Figure 4 [Etruscan Tombs] gives an idea of this kind of sepulchre.

At Cervetri (Cære) the tombs have no external decorations; a staircase leads down to one or several chambers, cut in the rock and containing sarcophagi or funerary couches. Such is the tomb known as the "Tomb of the Seats and Shields." Figures 1, 2 and 3 give the plan and sections of it. A stairway runs to a broad landing *a*, on which three rooms open. In the room *k*, to the right, there is a bench designed to seat persons assembled for the funeral ceremonies and the celebration of special rites; it may have been a sort of triclinium used for the same purpose as the one still to be seen at Pompeii in the Street of the Tombs. Room *l*, on the left, contains two sarcophagi and a funerary couch; whether the body was merely placed on this couch during the observance of certain forms, or whether it was left there for decomposition, we will not assume to decide. A door facing the stairs gives access to a large hall *b* which contains, besides six funeral couches *d*, the two seats *c*, with shields sculptured above them, from which the tomb is named. Three smaller rooms *e*, *g*, *h*, opened out of this large apartment; the benches *l* running around them



Tomb of Cecelia Metella.

discovered prove that the custom of burning the dead was, if not universal, at least quite widespread.

At Vulci, the ground was in generally too flat to be well adapted for the construction of tombs like those described

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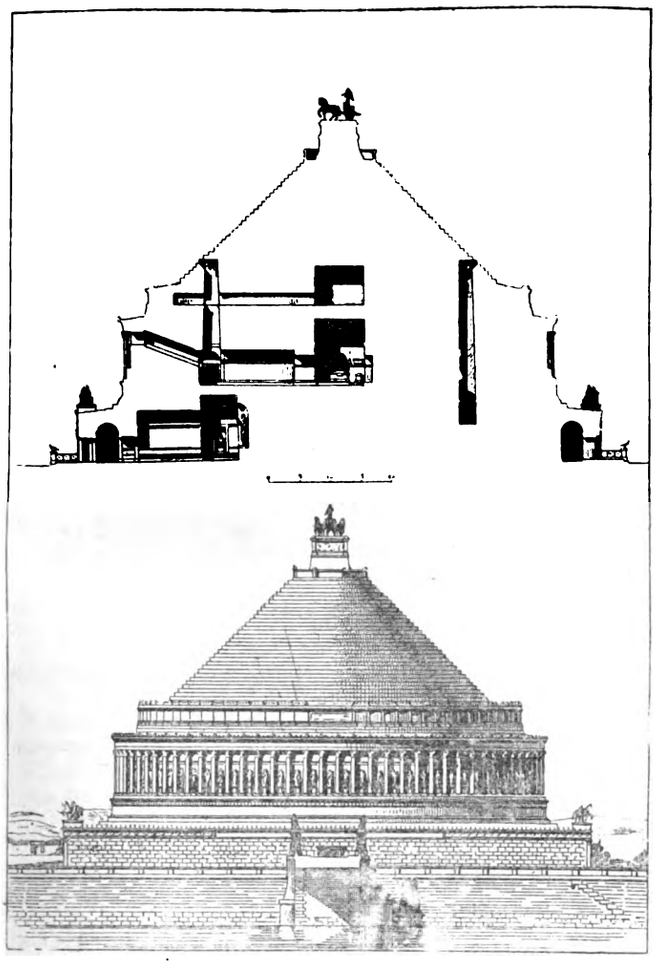
above. Here, therefore, the Etruscans contented themselves with excavating subterranean chambers, the ceilings of which were supported on pillars left in the mass of tufa.

Raoul Rochette has made a restoration of the tomb of Porsena according to Pliny's description, which was itself



Tomb of Hadrian.

borrowed from some other source. Everything touching this assemblage of conical or pyramidal tumuli seems so supposititious that we prefer to treat it as a fancy resting on no authentic basis.

THE ROMANS.

Though the Romans reached the zenith of pomp and splendor in funerary constructions, they did little but appropriate and transform the styles of earlier races. Without ever attaining to the immortal ascendency of Egyptian art, they built funerary monuments whose ruins give evidence of that same grandeur which they impressed on everything that came beneath their touch.

We have made no attempt to enumerate here the vast varieties of Roman tombs, we have merely sought to indicate in the plates and text those types which seem to us especially characteristic and noteworthy.

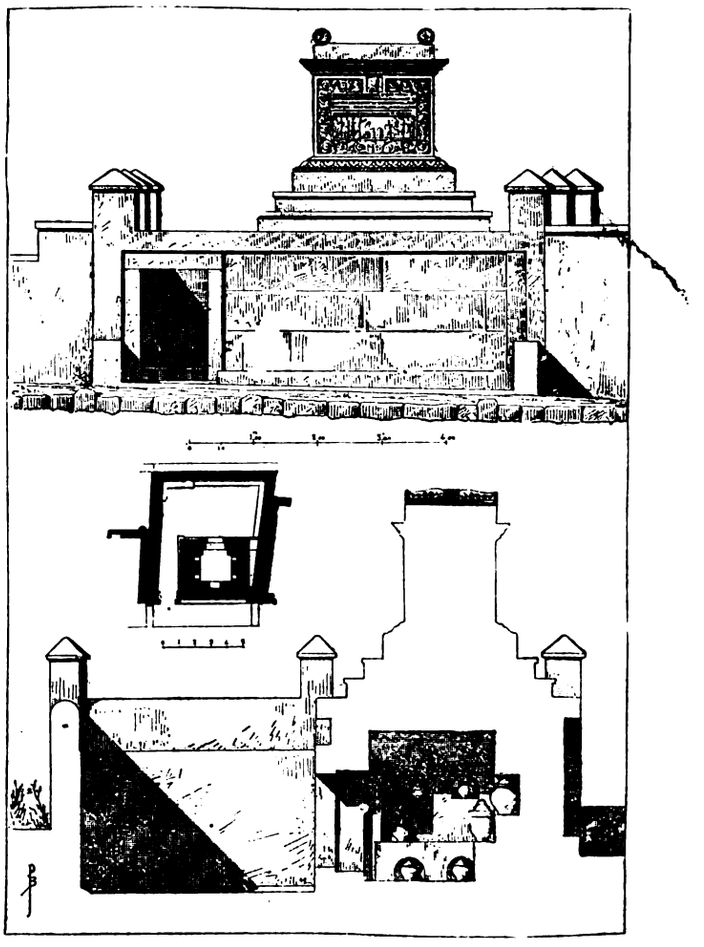
If an English-Latin dictionary be opened to the word "tomb," the words *Cenotaphium, Cepotaphium, Cippus, Columbarium, Conditivum or Conditorium, Mausoleum, Monumentum, Sepulcrum, Tumulus* and others will be found figuring there as translations. It must not be supposed, however, that these words are synonyms. Each, in reality, designates one of the different types of tombs adopted either simultaneously or successively by the Romans.

Their most ancient form of sepulchre seems to have been the *conditorium*. This term, in its exact signification, was applied, according to Rich, to underground vaults constructed to receive unburnt bodies; it was in use among the Romans at a very early period of their history. The *conditorium* is a genuine *hypogeum*. Such was the tomb of the Scipios between the Via Appia and the Via Latina. We may add, in passing, that the word "*conditorium*" is often applied, by extension, to the sarcophagus itself.

The word "*cenotaphium*" was employed solely to designate a monument erected to a person whose body could not be recovered, or whose ashes had been deposited elsewhere. "*Cepotaphium*" meant a tomb surrounded by a garden, or a garden consecrated to a tomb.

The term "*monumentum*" was applied indifferently to a cenotaph or a real tomb.

Mausoleum, a word whose origin is to be sought in the legendary splendor of the sepulchre of Mausolus, King of Caria, served to denominate burial monuments of such gigantic proportions as the Tomb of Adrian, called, also, because of its immense size, "*Moles Hadriana.*" This huge tomb, whose substructions, embattled and transformed into a fortress during the Middle Ages, to-day front the Pontus Ælius under the name of the Castle of S. Angelo, must have been an inconceivably imposing structure. We give [Adrian's Mausoleum] a restoration after M. Vaudremer. It has also been restored with two stories of colonnades. But this aspect of it is much less satisfactory. The forced reduction of the conical portion, which becomes in some sort a mere roof, destroys all its character. It is not at all probable that the bronze pine-cone, now in the Vatican Gardens, formed the crowning ornament of this colossal *tumulus*, as was long supposed: we say *tumulus*, for surely we cannot mistake the architect's source of inspiration. This source of inspiration is still more clearly recognizable in another great mausoleum which stood in the Campus Martius at Rome, the Mausoleum of Augustus. This monument, whose transformation into a circus has furnished the theme for many and varied reflections on the mutability of things here below, is, unfortunately, in a badly ruined condition; we believe, moreover, that it has never been the subject of very serious investigations. Like the Tomb of Adrian, it is a huge, cylindrical mass. The conical portion is supposed to have been covered



Tomb at Pompeii.

with earth and planted with trees. This would be a most significant reminder of the *tumulus*.

The tombs of the Plautian family on the Via Tiburtina, and of Cecilia Metella on the Via Appia, were designed in accordance with the same idea, though on a much smaller scale.

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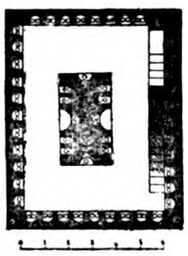
The latter [Tomb of Cecilia Metella] is one of the noblest and purest Roman sepulchral monuments now in existence. A substantial square basement, the marble coating of which has disappeared, and in which there are five chambers, supports the cylindrical part; this has a diameter of 93.96 feet, but, as the walls are 32.80 feet in thickness, the diameter of the central chamber is reduced to 28.36 feet. It was in this last-named chamber that, under the pontificate of Paul III, the beautiful sarcophagus was found, which may be seen to-day in the court of the Farnese Palace. The cylindrical portion is

A Roman Cippus.

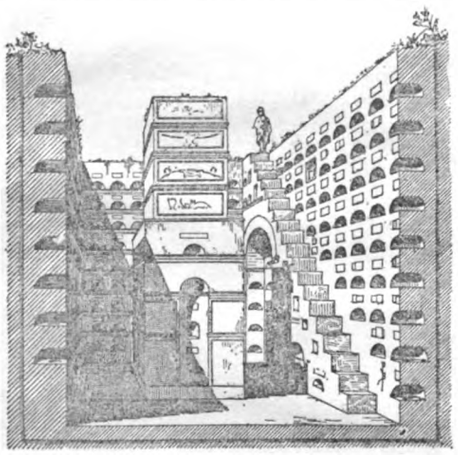


Plan of a Roman Columbarium.

built wholly of large blocks of travertine. It is crowned by an imposing cornice, with a frieze of ox-skulls joined by wreaths of bold design. On the frieze is the inscription which tells us that Cecilia Metella was the daughter of C. Cecilius Metellus, and the wife of the Triumvir Crassus. An attic above the cornice supports the battlement with which the structure was surmounted in the Middle Ages to transform it into a donjon for the castle of Boniface VIII. There was originally a conical roofing above the attic, which, judging from the thickness of the walls, may have been covered with earth for the planting of cypresses. The aspect of this monument is still extraordinarily impressive.

Many reductions of this type of tomb existed all along the Via Appia. They are likewise to be seen at Pompeii and in a large number of other places.

Since we have spoken of Pompeii, let us call attention to the sepulchres on the Street of the Tombs, several of which are



A Roman Columbarium.

Roman Funerary Urn.

very remarkable, notwithstanding their modest dimensions. The Tomb of the Garlands is too well-known to require description here. The greater part of these monuments resemble more or less closely the one represented in our cut [Tomb at Pompeii], which stands near the suburban villa known as the Villa of Diomedes, being separated from it by only the funeral triclinium. It comprises an enclosure, within which is a square basement bearing a sort of cubical pedestal; the latter is covered with inscriptions and bas-reliefs. A glance at our illustration shows that this is not a single tomb, but rather a *sepulcrum familiare*, a veritable advance toward the *columbaria* of which we shall treat farther on.

The most widely dispersed of the Roman sepulchral monuments are the *cippi*. The *cippus* is always of modest proportions; it consists of a sort of pedestal bearing an inscription, and presenting surfaces which are sometimes adorned with the plainest mouldings, and sometimes laden with garlands of fruits and with decorations of every other kind. It was erected as a tombstone above the spot where a person was interred. During the period when the custom of incineration prevailed, there was a cavity in the interior of the *cippus* to receive the ashes of the dead. Our illustration shows one of the most beautiful specimens of ornate *cippi*.

Roman Funerary Urn.

Though the general character of the great Roman sepulchres was inspired, as we have hitherto seen, by the traditional *tumulus* of primitive races, certain ones exist which are almost servile reproductions of foreign monuments. Such, for example, is the great pyramid forming the tomb of Caius Sestius at Rome. An interior chamber, which can be reached only through a narrow corridor, and whose walls are of stucco covered with paintings, originally held the cinerary urn.

Though often content to copy their predecessors, as in the case just cited, it remained for this eminently practical

Tomb at Palmyra.

people to create a type of tomb wherein respect for the dead should be reconciled with the observance of the elementary laws of hygiene. From this double point-of-view, the *columbaria* around Rome may be said to furnish a most ingenious solution of a very serious problem; they prove, too, how widespread the custom of cremation was at certain periods. In

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early times, incineration was resorted to only concurrently with the other methods of inhumation; later on the custom became universal, and the place assigned to the dead being reduced to the smallest proportions consistent with the respect due them, was no longer of a character to incommode the living. The *columbaria* furnish, then, a type of Roman tombs essentially different from the types of other peoples.

They were vaulted, underground, sepulchral chambers; in the walls there were rows of little niches quite like pigeon-coves, and it was from these that the name *columbarium* was derived. Each niche was large enough to hold two cinerary urns.

We copy from Campana's work the plan and the section in perspective of one of the *columbaria* which he unearthed during his excavations. The vaulting, which has disappeared, must have been a simple barrel arch. The walls exhibit many rows of pigeon-holes, and, as if these had proved inadequate, a mass of masonry was constructed in the centre of the chamber, with a large number of niches in its faces; the room is reached by a narrow staircase, the partition-wall of which contains still other niches. Beneath each of these openings is a marble plate, scarcely more than a label, inscribed with the family names and the *prænomina* of the dead. Our illustrations are of a *commune sepulcrum;* that is to say, a tomb designed for the use of several families. There were also *columbaria* reserved for the members of a single family, but in such cases the number of niches was considerably less. The ashes of unimportant persons were placed in simple terra-cotta jars covered with a lid. In the case of more distinguished personages, they were deposited in a sort of marble casket, which was more or less decorated, and sometimes assumed the proportions of a *cippus*. The urns, properly so called, exhibit a great variety of shapes; some of them are very richly sculptured, like the one shown in our illustration.

Is the huge sepulchral pylon now standing amid the ruins of Palmyra, and which figures among the illustrations of this article, to be considered as a specimen of a Roman tomb? We think not; yet, in spite of its originality, it seems to belong, in the details and mouldings, to Roman art. However this may be, the monument possesses a most impressive character.

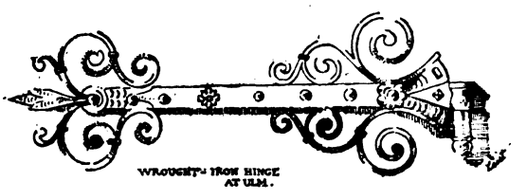
Before finishing with the sepulchral architecture of those ancient civilizations which may be termed Classical, it seems desirable to sum up in a few words its general features.

The burial monuments belonging to these civilizations are placed, with rare exceptions, just outside of the cities, and, though more or less transformed, they all hold to the primordial types of *hypogeum*, *tumulus* and *stela*. The sepulchral style is characterized by general forms, which are nearly always the same. It is to the *ensemble* of the monument that we are to look to for its distinctive character, and not to the details or the ornamentation, which are perceptibly similar to those of contemporary civil and religious edifices. And, lastly, the aspect of these monuments seems to demonstrate that they were not intended to awaken among these ancient peoples any very dreadful idea of death. Nowhere do we find traces of that fear of punishment and, consequently, terror of death, which the Christian dogmas were destined to inspire. All that we can learn from the funeral rites goes to prove that every one was made familiar with that passage to a new existence which Christianity has enveloped with so many difficulties. The repulsion which the sight of death arouses in us seems to have been unknown to the ancients. They accustomed themselves to living among tombs, not merely because these often contained only ashes, and were, consequently, stripped of the horrors of decomposition, but also because there were none of those representations of corpses on them which, as we shall see, appear on the tombstones of the Middle Ages. And so the tombs are found ranged along the roadsides, just beyond the city gates. Is not the delightful villa we have mentioned at Pompeii surrounded by sepulchres? It does not appear that the proximity to the dead possessed any mournful associations for the living, or detracted from the charms of this lovely dwelling.

[To be continued.]

THE BRONZE GATES FOR COLOGNE CATHEDRAL.—The magnificent bronze gates for the Cologne Cathedral, which have been manufacturing for several years, are now nearly completed, and they will be placed in position and inaugurated in the course of next spring. They represent the four seasons, the four ages of man, and the wise and foolish virgins, and the elaborate ornaments are beautifully executed, consisting of groups of animals and plants and coats-of-arms.—*New York Commercial Advertiser.*

SAFE BUILDING.[1]—XXXVIII.



THE full heavy curved lines in Tables XXXVIII, XXXIX and XL give the single and double shearing values for the same sized pins and rivets as in the previous three tables.

Tables xxxviii, xxxix, xl. The additional vertical columns to the left in these tables give the areas of cross sections in square inches, of the different sized pins and rivets, which multiplied by ten give their weights in pounds per yard of length for wrought-iron, (for steel add 2 per cent to the weight of wrought-iron). There are also full heavy curve lines giving the strength, in tension, of tie-rods of same diameter as pins or rivets. The values selected for these curves are those *always* used by the writer in calculating pins, rivets or tie-rods.

For different values. It sometimes becomes desirable, in temporary work to use higher values, or in very important permanent structures with moving loads to use lower values. But even in such cases the tables can be used, for, as all of these curves are directly dependent on the area (or double area), of cross section of the rivet or pin, they can, of course, be used interchangeably. That is, any one who wishes to figure the safe shearing $\left(\frac{q}{f}\right)$ for steel as $=15000$ pounds, instead of 10000 pounds, can take the curve marked "15000 pounds—tension steel," in any of the three tables.

Or, if he wishes to figure his iron at only 10000 pounds safe stress for tension, that is $\left(\frac{t}{f}\right)=10000$ pounds, he will, instead of using the curve marked "12000 pounds—tension wrought-iron," take the curve marked "10000 pounds—single shear steel."

The writer, however, always sticks to the one set of values for tension, and for pins and rivets to those given in tables (also after Formula 115), as they are certainly *safe* values, and yet not low enough to make the work excessively costly. Iron contractors will frequently quote off-hand opinions of celebrated engineers saying these values are much too low and thus backing up their economical tendencies in trying to add lightness (and beauty) to roof trusses and plate girders, but as a rule the opinions are either not authentic, or else it is found that the celebrated engineer, when delivering the opinion, had a similar axe to grind, as had the contractor. Good engineers as well as good architects, will attempt to save their clients all they can, but hardly at the risk of taking chances in their most important constructive works. The figures along the *tops* of Tables XXXVIII to XL give the values of either iron or steel, according, of course, to which curve is used.

Curve of Bending-moment. The dotted curved lines in the Tables XXXVIII to XL give the safe bending-moments for iron and steel pins and rivets, and for these the *lower* horizontal lines of figures are used.

How to use Tables. The use of the tables is simple, similar to the other tables with curves. Thus if we have a $\frac{5}{8}$″ steel rivet bearing against a $\frac{7}{16}$″ steel plate, we use Table XXXV and pass horizontally to the right from the vertical figure (or diameter marked) $\frac{5}{8}$″ till we strike the (fourth) slanting full bearing line, marked $\frac{7}{16}$″. This is one-third way between

Bearing Values. the vertical lines marked (*below* for steel) 4000 and the next vertical unmarked line to the right; as each vertical space at the bottom (steel) evidently is one-fourth of a thousand or 250 pounds, a third space will, of course, be 83 pounds, or a $\frac{5}{8}$″ steel rivet bearing against a $\frac{7}{16}$″ steel plate will resist safely 4083 pounds. Had we calculated arithmetically we should have had

$\frac{5}{8}.\ \frac{7}{16}.\ 15000=4101$ pounds.

Had the rivet and plate been of wrought-iron we should have used the *upper* line of figures; here the intersection is one-third way between the second and third unmarked lines after 3000; as there are five spaces above between each thousand, each space evidently represents one-fifth of a 1000 or 200 pounds for iron, so that the bearing value for a $\frac{5}{8}$″ iron rivet against a $\frac{7}{16}$″ iron plate would be $3000+200+\frac{1}{3}.\ 200=3267$ pounds. By calculation we should have had $\frac{5}{8}.\ \frac{7}{16}.\ 12000=3281$ pounds.

The single shearing value of a $\frac{5}{8}$″ steel rivet at $\left(\frac{q}{f}\right)=10000$ pounds would be $=3067$ pounds; for, the horizontal line $\frac{5}{8}$″ in Table

Shearing Values. XXXVIII strikes the single shearing curve for steel about one-third way between vertical line marked at the *top* 3000 and the next unmarked line to the right. Each space evidently represents 200 pounds, so that we should have for the steel $\frac{5}{8}$″ rivet in single shear $3000+\frac{1}{3}.\ 200=3067$ pounds. By arithmetical calculation we should have had the area of a $\frac{5}{8}$″ circle multiplied by 10000 pounds or

$0{,}3068.\ 10000=3068$ pounds.

[1] Continued from No. 739, page 123.

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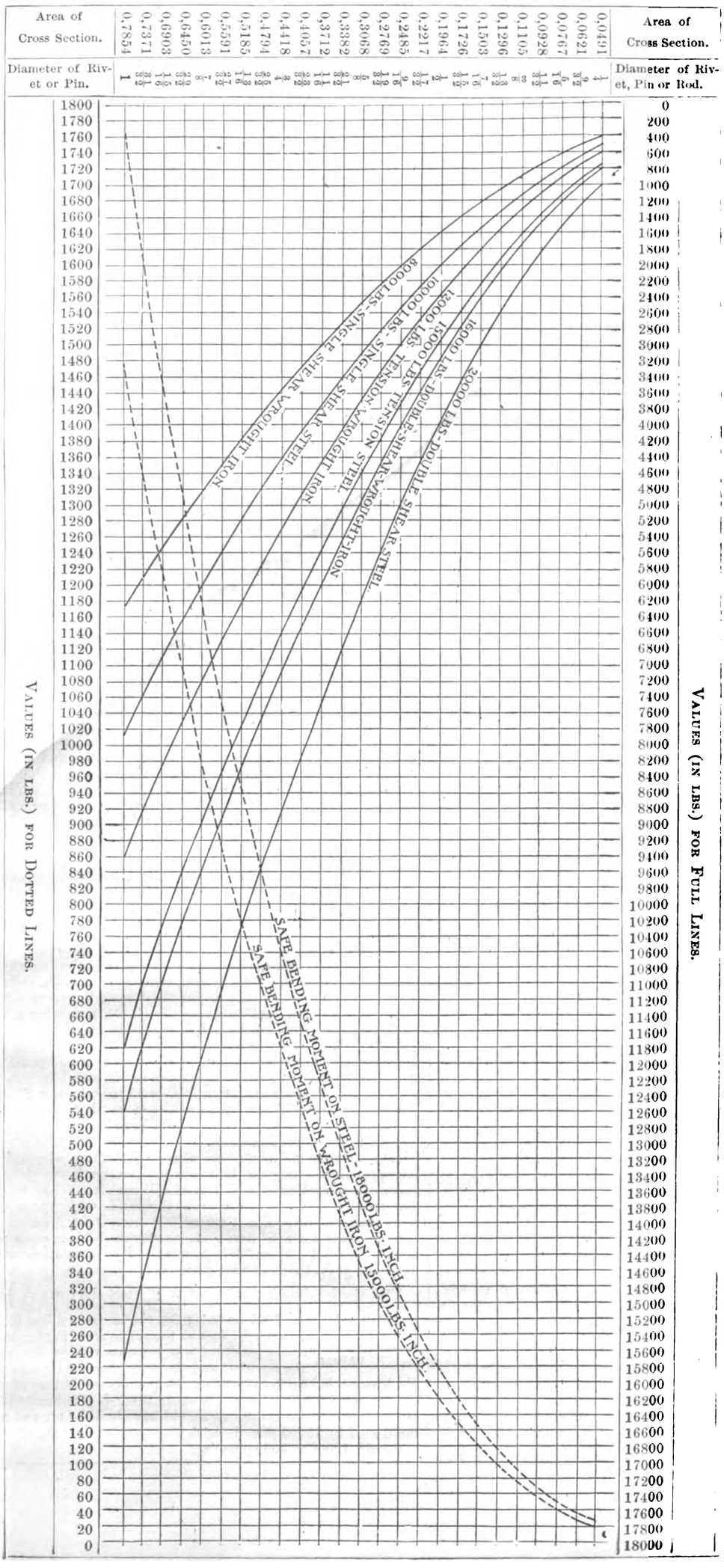
TABLE XXXVIII.

Shearing, Bending and Tensional Values.

FOR IRON AND STEEL RIVETS, PINS AND RODS OF ONE-FOURTH TO ONE INCH IN DIAMETER.


Area of Cross Section.
0.7854 0.7371 0.6903 0.6450 0.6013 0.5591 0.5185 0.4794 0.4418 0.4057 0.3712 0.3382 0.3068 0.2769 0.2485 0.2217 0.1964 0.1726 0.1503 0.1296 0.1105 0.0928 0.0767 0.0621 0.0491
Diameter of Rivet or Pin.
1 15/16 7/8 13/16 3/4 11/16 5/8 9/16 1/2 7/16 3/8 5/16 1/4
Area of Cross Section.
Diameter of Rivet, Pin or Rod.
80000 LBS.-SINGLE SHEAR WROUGHT IRON
100000 LBS.-SINGLE SHEAR STEEL
120000 LBS. TENSION WROUGHT IRON
150000 LBS. TENSION STEEL
160000 LBS.-DOUBLE SHEAR WROUGHT-IRON
200000 LBS.-DOUBLE SHEAR STEEL
SAFE BENDING MOMENT ON STEEL-18000 LBS-INCH
SAFE BENDING MOMENT ON WROUGHT IRON-13000 LBS-INCH
Values (in lbs.) for Dotted Lines.
Values (in lbs.) for Full Lines.

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The double shearing value of a $\frac{5}{8}''$ rivet would be double this, or $= 6136$ pounds, and this is confirmed by the Table (XXXVIII), as the horizontal line $\frac{5}{8}''$ strikes the double shearing curve for steel 20000 pounds about two-thirds way between vertical line marked *above* 6000 and its next unmarked line to the right, or

$6000 + \frac{2}{3}.200 = 6134$ pounds.

For the safe bending-moment we find the horizontal line $\frac{5}{8}''$ strikes dotted curved line marked "safe bending-moment on steel at 18000 pounds" on the second vertical unmarked line to the left of the one marked *at the bottom* 500; each space below is evidently 20 pounds, and as they increase to the left we must add the two spaces, or $500 + 40 = 540$ pounds, which would be the safe bending-moment on a $\frac{5}{8}''$ steel rivet or pin.

Bending-moment Curve.

Or to illustrate further take the last *Example* (*III*). We had a 1″ steel plate and 1″ steel rivet. The actual bending-moment we found was

$$\frac{u.l}{8} = \frac{135000.1}{8} = 16875$$

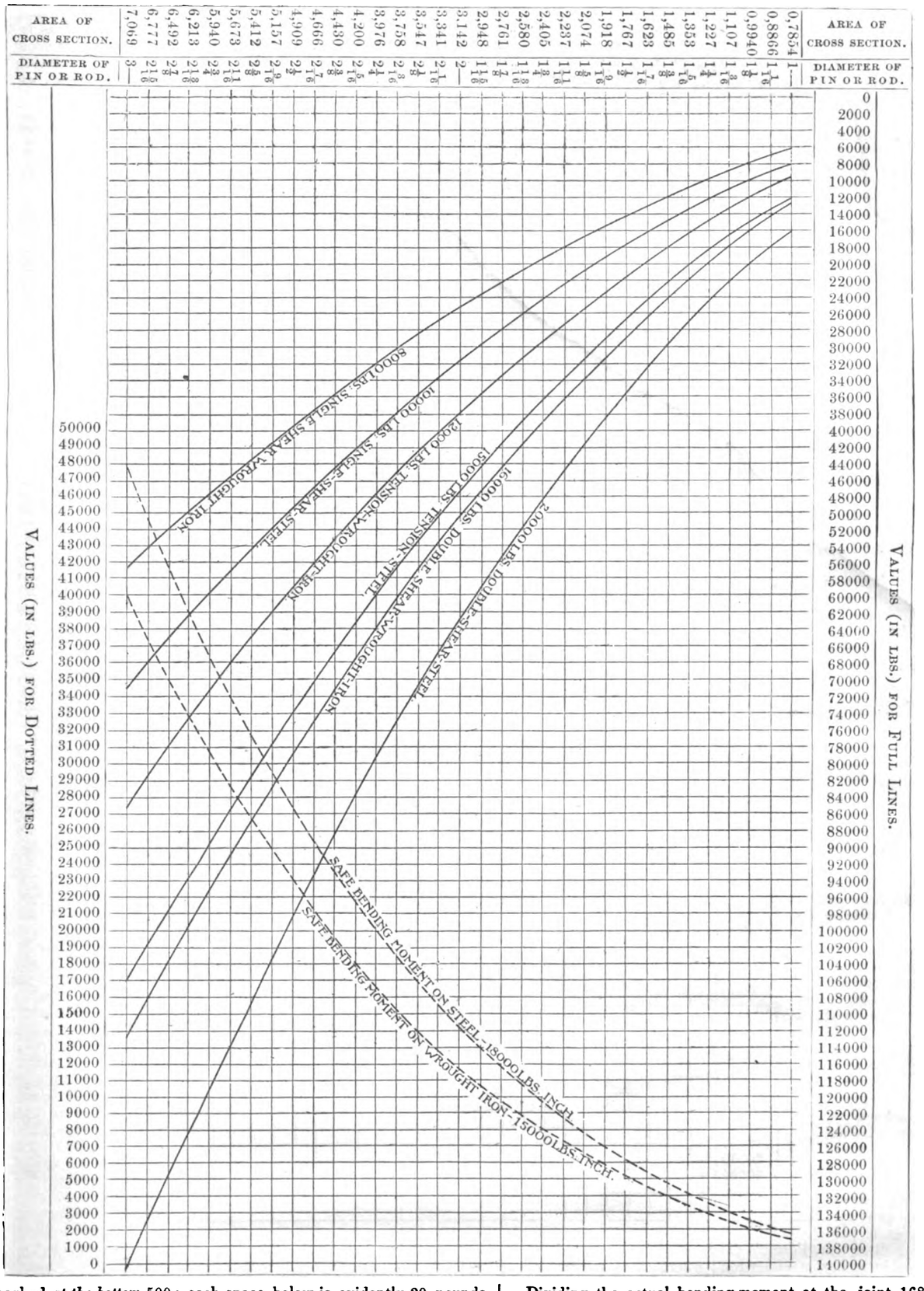
From Table XXXVIII we see that the safe bending-moment on a 1″ steel rivet is the intersection of horizontal line 1″ being one-third way between third and fourth vertical unmarked lines to the left of $1700 = 1700 + 3\frac{1}{3}.20 = 1767$ pounds-inch.

Dividing the actual bending-moment at the joint 16875 pounds-inch, by the safe bending-moment on each rivet, will, of course, give the number of rivets required, or

$$\frac{16875}{1767} = 9{,}55$$

TABLE XXXIX.

SHEARING, BENDING AND TENSIONAL VALUES FOR IRON AND STEEL PINS AND RODS 1 TO 3 INCHES IN DIAMETER.



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being the same result as before, namely, 10 rivets. Take *Example II*, we had the same rivet, plate and strain, but there was but one cover-plate and the rivet was practically a cantilever.

The bending-moment was

$$\frac{u.l}{2} = \frac{135000.1}{2} = 62500 \text{ pounds-inch.}$$

This divided by the safe bending-moment on each rivet (1767 pounds-inch) as found in Table XXXVIII gives the number of rivets required, or

$$\frac{62500}{1767} = 35{,}4 \text{ or same as before.}$$

The use of Tables for pins or tie-rods, is, of course, exactly similar to use for rivets, as already described.

Bearing on pins. For instance, we have a 2″ pin bearing against a $1\frac{1}{8}$ inch thick eye-bar or head of a tie-rod. We use Table XXXVI, the 2 inch horizontal line, strikes the full slanting line marked $1\frac{1}{8}$ inch exactly on one of the vertical lines. If both pin and eye-bar are wrought-iron — (or if either were wrought-iron we should use the smaller value) — we use the *top* line of figures, or we find our vertical line the third to the right of 24000 and as each space evidently represents 1000 pounds, the safe bearing value of our 2 inch pin against a $1\frac{1}{8}$ inch thick eye-bar would be 27000 pounds, if one or both are of wrought-iron. Had both pin and eye-bar been of steel, we should have used the bottom line of figures, where each space evidently represents 1250 pounds, and we should have had 33750 pounds.

Shearing of Pins. The safe shearing value for a 2 inch wrought-iron pin, would be from Table XXXIX = 25000 pounds, and for steel 31670 pounds.

By calculation we should have had for iron = 25133 pounds and for steel = 31416 pounds.

Tension on Rods. If we had a 2 inch circular tie-rod its strength in tension from Table XXXIX would be, if of wrought-iron = 37600 pounds and if of steel = 47000 pounds.

By calculation we should have had for iron = 37752 pounds and for steel = 47190 pounds.

Calculation of Pins. Pins are calculated similarly to rivets. The same formulæ can be used for bearing area (109) h being the thickness of head of eye-bar, in inches, and for single shear (110) and double shear (111).

For bending where there are but two eye-bars or rods, each pulling in opposite directions, Formula (112) could be used; using for h the thickness, in inches, of either rod; where there are two eye-bars or rods pulling in one direction with only one between them pulling in the opposite direction Formula (113) might be used; h in this case being the thickness, in inches, of the large (central) single rod, and twice the thickness of either of the smaller rods. In all of the formulæ x should be = 1.

As a rule, however, there are several rods at each pin-connected joint, and the bending-moment has to be carefully calculated for each special case. In designing pin-joints this should be borne in mind, and the pieces with largest strains brought as closely together, as possible, to avoid excessive bending-moments, which will require very large pins, and necessitate large eyes and heads to the rods and bars, which means, of course, very great expense; pin-connections for small trusses are more expensive than riveted joints; for large trusses they are cheaper. They are very much better in both cases, more easy to transport and erect, and agree much nearer with the theoretical calculation, which assumes that all members around a joint are free to move, and not rigid, as is the case in riveted trusses. Then, too, in case of any movement in the truss, it can be readily adjusted by means of nuts, swivel-links, sleeve-nuts, etc. This cannot be done in a riveted truss, as the joints not being flexible, the tightening of any one part might throw strains on some joint not able to bear it.

Designing Pin-Joint.

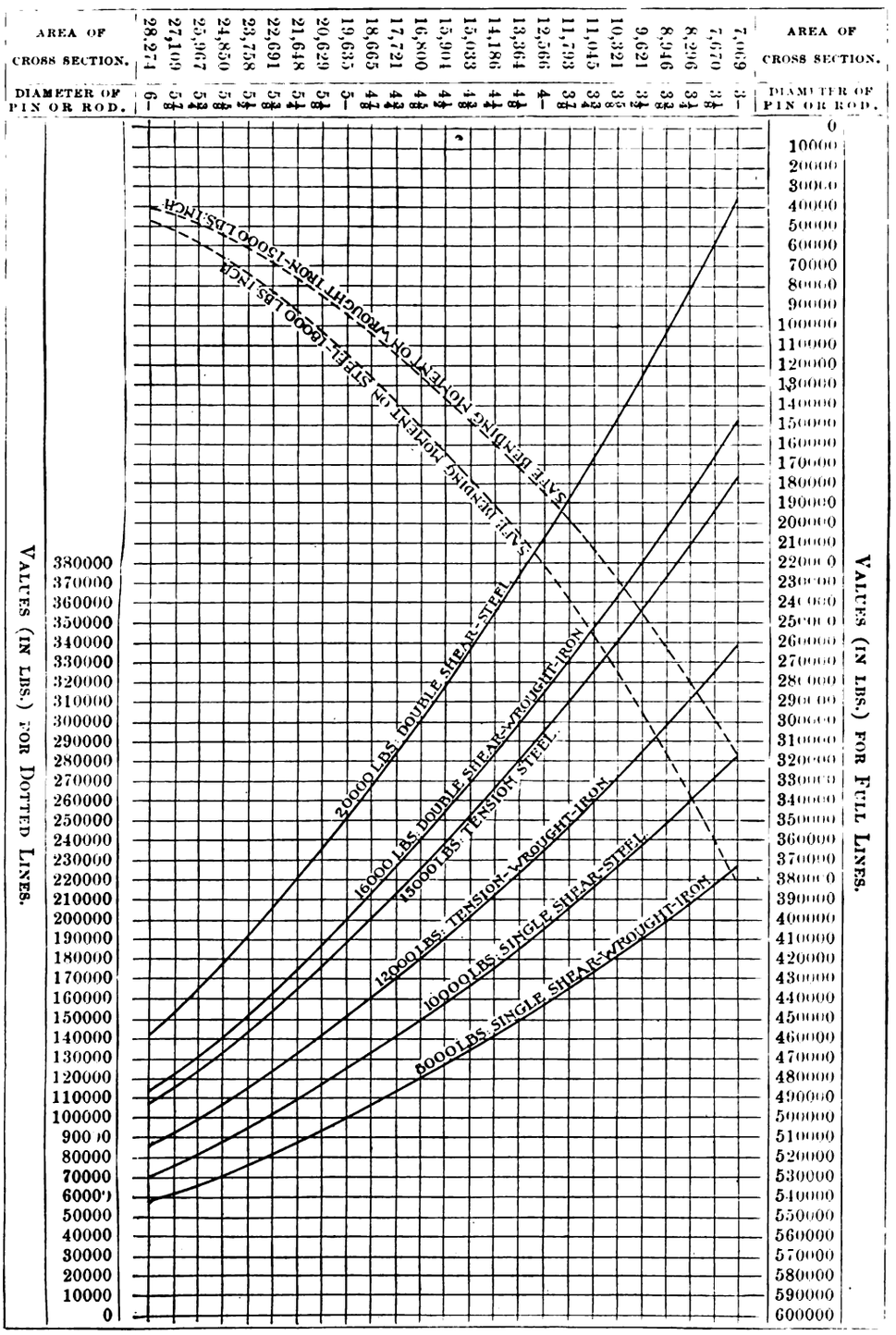
Pin-joint best.

Louis DeCoppet Berg.

(To be continued.)

TABLE XL.

SHEARING, BENDING AND TENSIONAL VALUES FOR IRON AND STEEL PINS AND RODS 3 TO 6 INCHES IN DIAMETER.



CITY-HALL PARK SAFE. — The New York Senate has passed Senator Ahearn's bill exempting City-Hall Park from use as the site of the proposed municipal buildings.

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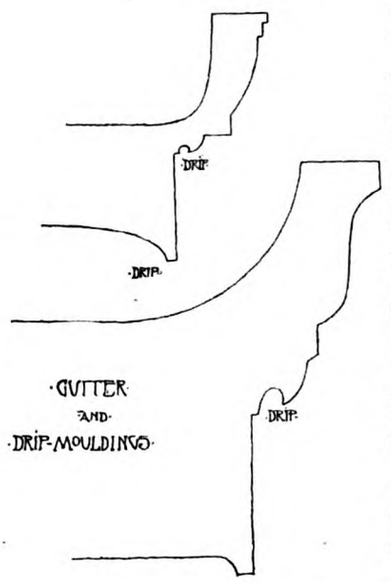
GREEK MOULDINGS AS CLASSIFIED CHARACTERISTICALLY.



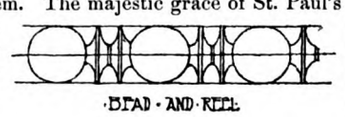
THE human body has been called "The house we live in," and the comparisons which may be instituted between its construction and arrangements and those of artificial architecture, are by no means mere exercises of fancy. The combination of beauty and convenience which this piece of Nature's work presents in its perfection, is that which architects are ever aiming at; and no less is the marvellous adjustment and arrangements of parts which are responsible for different services yet which are all bound to render their services in harmonious concert. The problems of determining the particular selection of services which are required to contribute to the main ultimate purposes of use and enjoyment, and their relative masses and collocations, which exercise the ingenuity and invention of the architect, are all solved here as if for an exemplar. The grouping and distribution of the offices, apartments and adjuncts of a structure which is to accommodate a great national establishment and be at the same time a pride and a delight to a nation, involve efforts which share "with great creative nature."

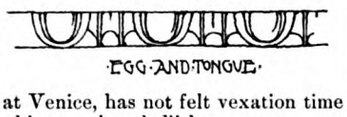
Art like nature — and indeed it may be said, because art is portion of Nature — is wont to make distinction between Front, where liveliest expression culminates, and subordinated Rear; it groups its masses with reference to principal differences and dependences of functions, and at the same time compasses an outward symmetry by subjecting an unsymmetrical interior of most closely connected parts, to a uniform screen.

The exactness of bilateral symmetry about a central vertical line, is as conspicuous in most stately buildings as in the human body; but on the other hand, the grace and beauty of the human figure is not displayed to most advantage when it is posed full front and bolt upright, with feet together and shoulders square. Its true beauty becomes most apparent when this precise correspondence is exhibited as affected, and so far disturbed, by some obvious motive. This difference depends on mobility being the virtue of a living organism, and absolute immobility that of an architectural structure. Yet is the latter not precluded from some analogous variety, only its origin is transferred. If it is unchangeable relatively to a point of view,— the point of view may be changed. We give it motion when we ourselves move, and may feel much as Bassanio when he contemplates the portrait of Portia:

> "Fair Portia's counterfeit! What demigod
> Hath come so near creation? Move these eyes?
> Or, whether riding on the orbs of mine
> Seem they in motion?"

We may walk round Wells or Salisbury Cathedral and be affected very much as by a narrative poem. The majestic grace of St. Paul's seems to unfold itself as we see it with constantly varying effect from Watling Street or Ludgate Hill; or as we pass from Ludgate Hill to Cheapside. What but an effect of lifelessness,— of *rigor mortis* — is produced by an imposing structure which presents no view at the angle or on flank? Who in passing along the Grand Canal at Venice, has not felt vexation time after time at the inability of architectural embellishment to turn a corner,— at façades of pretension and of merit equal to pretension, which cannot be viewed at an angle without being betrayed as mere screens.





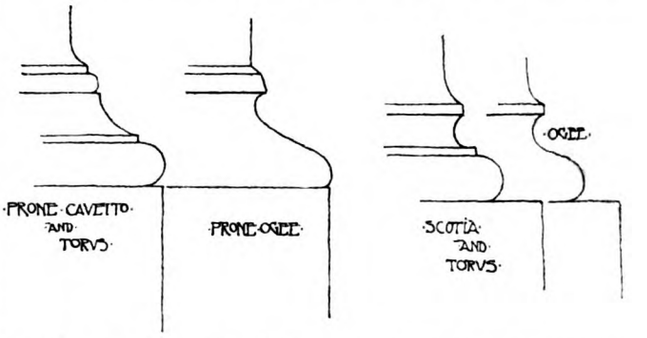
Much therefore might be written on the analogy between our bodily organization and a noble palace in respect of the due proportions, the groupings and distribution of offices and apartments according to the importance and dignity of the functions which they subserve and the requirements for communication between them. But there may be more novel interest in pursuing a comparison which illustrates the rationale of a characteristic profile. The profile of a Greek sacred structure is completely exhibited by a section through pediment, entablature, column, stylobate. Such a section makes manifest at once a rule of obedience to a governing principle of sheltering lower members by the projection of upper. Shelter may be sought either from downfall of rain or the rays of a burning sun, and more or less absolutely, according to the balance of effect appropriate to a special occasion. On the one hand the utilitarian purpose may be strongly emphasized; sheltered passages may be made as wide as possible, and projecting ledges thrust as far forward as possible. On the other hand, when grace and beauty are to dominate without ignoring utility, the anxiety for protection may be deliberately removed from conspicuousness as an urgent purpose, while the suggestion of it is sufficiently retained to unite as with a pervading motive, the general treatment of the design. In an artistic composition as in a vital organism, it is of the nature of a motive of prime importance to assert itself all but universally and in a great diversity of degrees, but as if spontaneously not painfully and eagerly; most decisively where the function it subserves is most pronounced, only moderately where this need is less pronounced, but even by faint suggestion where there is no real need for it at all.

As regards any expression of shelter from heat of the sun's rays, there is no such breadth given to the ambulatory of the Greek temple and no such large projection to the cornice of the order as to convey that it entered here into consideration; the general roofing of both naos and ambulatory was, of course, effective in regard to such shelter and so declared itself, but by the inclination given to it it declared still more directly that its predominant purpose was shelter from water and to carry rainfall clear of the general building. The presentation of the roof to the sun's rays as an inclined plane, would rather enhance than mitigate their heating-power.

A vertical line from the fillet of the corona of the Parthenon shows a projection beyond the horizontal cornice below it of 0.593, about seven inches. A vertical from the cornice gives a projection beyond the abacus of the column which is in advance of frieze and architrave of 1.707 (Penrose, Pl. VII,) and beyond the stylobate of 1.454 or only well beyond the half of the step below it.

As the abacus of the column projected on the stylobate extends 0.237 beyond the circle of its base, it has the same covering relation to the shaft below it as the general cornice to both entablature and columns; the same motive is still apparent in the band which surmounts the architrave and in the capital of the triglyphs. In the earlier Doric of the Æginetan temple the sheltering character of the capital of the column is emphasized by a much more considerable difference of diameter beyond that of the base, and the title "cap" in its special sense seems more applicable to it than "capital."

To return to our analogy; the human countenance is the object which of all others is regarded by us not only with most interest,



but by far more frequently than any other; the interest with which it is regarded is enhanced by the widest range of associations and the most intimate personal sympathy, and it is impossible that its characteristics should not be so impressed upon our imaginations as to affect our sense of any combinations which are in any way correspondent. Even so much is implied in the very word façade as in the Greek *πρόσωπον* (*Pindar*, Pl. VI, 3) applied to the fore-front of a building, or in corona, as its crowning ornamental moulding.

It is not pretended that the architect has the relative human features in his mind when he designs a portico, but in such a design he employs art to meet the same contingences which marvellous spontaneousness allows for in nature; and the analogy, however it may evade distinct recognition, must none the less contribute to appreciative apprehension of truth and propriety.

The protective hair of the head — it would be well to naturalize the graceful word "*chevelure*" — comes most directly into comparison with more primitive resources for roofing, as with humble thatch, but the suggestion is not lost even for the marble tiling of Ictinus. The principle of upper members giving cover and protection to those below, as traced in the eyebrows which intercept and divert the perspiration of the forehead, and protects the eyelid as the eyelid does the eye. The moustache again and even the curvature of the upper lip diverts moisture, or precludes the thought of possible annoying moisture from the nostril; and the point of the upper lip advances beyond the lower, as the lower, in a fine profile, advances slightly beyond the chin.

The outline of the human countenance as seen in profile or other varied presentations, combines a greater number and variety of beautiful curves harmoniously grouped and combined, than any other object whatever. This applies particularly to a single example and generally to an inexhaustible number. It may well have been in consequence of their refined sense and enthusiastic admiration of the beauty of the human features and forms, that the Greeks were

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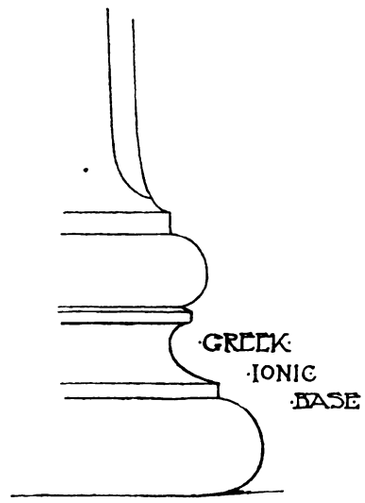
led to the study of elementary curvature as enrichment of crude architectural members.

An attempt has been made in a previous paper to define the variety of mouldings which were in most favor with the Greeks. We may arrange them in classes, as we may arrange well-studied mouldings of all styles, as gutter-mouldings and drip-mouldings on the one hand, and on the other bracket-mouldings and foot-mouldings.

Gutter-mouldings or let us call them more prettily, "brim-mouldings," represented by the section through the side of a bowl, have as their type the corona of a cornice. The corona of the Parthenon pediment is an erect ovolo, of Bassæ an erect cyma. So also is that of the Theseum, which was returned along the flanks. The bulge is appropriate expression of the function of intercepting water and conducting it to an outlet. Where, in accordance with our stated premise, do we find an analogy in the human countenance? Let us say in the hair which, as thrown back from the face and forehead, is in the same relation to the covering *chevelure* as the brim-moulding to the roof of marble tiles which it borders.

The drip-moulding is, of course, the under-cut or throated, sometimes called hawk's-beak, moulding, which prevents moisture drawing back and running down the face of the work: the term also includes the sharp upward notch from the vertical face of the cornice, and then also the grand cavetto of the raking cornice of the pediment.

The small curved-line drip, as often treated by the Greeks, affords peculiarly delicate effects of light and shade; the advanced curve receives light above which gradually dies into shadow, and the shadow cast by it was received again on a convex surface. This moulding was also susceptible of elegantly contrasted enrichment by alternated colored stripes above the same in reversed alternation underneath. This value recommended it for employment, not only in its most natural and properly serviceable position along the edge of the horizontal cornice, but also in sheltered positions where it was only suggestive of its specific function. Thus we find it in the nook of tympanum and raking cornice at Ægina, the Theseum, Parthenon and Propylæ, but not at Bassæ. No less universally do we find it applied in such perfectly protected places as the capitals of antæ and architraves of naos walls. What we trace here is not an architectural solecism, but an expression of the vigor of a leading motive which asserts itself irrepressibly at every suggestive opportunity. There is no moulding of equal delicacy and variety of curve which projects so independently, and in these respects it seems to be the true sign of solicitous finish and feeling treatment.



It was precisely with the adoption and due appreciation of this feature, the drip-moulding — to be endlessly modified — that graceful refinement accrued in the progress from Norman architecture to Early English.

The erect ogee may be adopted as the type of the class of what may be termed for want of a better title "bracket mouldings" — mouldings of which the specific function is less the manifest support of a superior member than expressive accentuation of the fact that such a point is responsible for support. This function is sometimes encroached upon as we have seen by the drip-moulding, which is, in fact, an under-cut ogee, but taken generally the distinction holds. The boldest expression of it is the echinus of the capital of the Doric column, but it is employed on a smaller scale and with beautiful variations in degree of erectness and proportion of the convex to the concave return, in a great variety of applications. These may be studied with interest and admiration in Cockerell's beautiful plates of the Temple of Bassæ. This temple was ascribed to the same architect as the Parthenon, and exemplifies the same theory of proportion; but its smaller size made a more detailed treatment appropriate, and in consequence it offers a far richer repertory of mouldings.

The ovolo is essentially a bracket-moulding and is susceptible of beautiful variation in the proportions of its curve, and its character is not lost when it is carved as what is called an egg-and-tongue moulding. This peculiar treatment of it is derived from the bead-and-reel string-moulding, which in its turn it seems as natural to derive from necklaces of round beads with alternate flattened ones, of which numerous ancient examples are in our museums, as from the customary sacred fillets of white wool tied at frequent regular intervals. Yet it can scarcely have been but from the sentiment of the appropriateness of a tænia to a sacred building, that this moulding is carried all round the Parthenon immediately under the cornice and returned with each projection of a triglyph, yet so small that even if heightened by color it must have been at such height from the ground and in shade also, absolutely undiscernible.

However this may be, it will be seen at once that the egg-and-tongue moulding is only the lower half of the bead-and-reel.

The proper type of a foot-moulding, as having its lowest portion advanced beyond the upper, is the prone ogee. This simple curve is characteristic still of the base mouldings in which its compound line seems resolved into a prone cavetto and a torus; and still more positively into a scotia and torus. [See the illustrations in the article on the "Theory of the Mouldings," *American Architect* for Oct. 5, 1889.]

The duplication of this form gives us the compound profile which reappears so constantly, with whatever variations of proportion, in the Ionic base.

Of this combination so delicately and expressively emphasized, the earliest known example is on the column sculptured in relief between the two supporting lions on the gateway at Mycenæ. But there it appears as a capital — inverted in fact — and, therefore, analogous to a bracket-moulding. The association here is startling; it occurs as a single link between proper Hellenic architecture and a style which in its construction and ornament is so alien as to drive us to help ourselves with such a makeshift title as "Pelasgian." Its later history is as remarkable: after giving in graceful modifications an ever-valued embellishment to Ionic and Corinthian monuments, it passed through many intermediate stages into Gothic. It reappears as a base for pier, pillar and pillaret, sometimes reminiscent of its Classic proportions, but usually subjected to that free experimental energy by which the Mediævals asserted their daring originality. The upper torus is often exceedingly reduced, and so also is the scotia which again is far less erect, sometimes, indeed, partly sunk into the plane of the lower torus and treated in a manner to secure a very positive shadow. Much the same variations are found in it when it is reversed to form a capital, reverting after ages to the primeval Mycenæan type.

It is in this reversed position that it was adapted to the architraves of the pointed arch, and here it is that it receives its most multifarious and glorious treatment. The motive is distinctly present and recognized in sections of early English arch-mouldings of exquisite grace, and is continued through other styles. In this adaptation it was analogous to a member of a cornice, and the designers did not hesitate to get a further effect by combining with it suggestions of the drip-moulding.

It was not the manner of the Mediævals to keep within the same limit of chastened reserve as the Greeks. The models which came to them from Classic times received no more reverent usage than the inflexions of classic nouns and verbs. Both were broken up or obliterated as convenience or necessity dictated. Language passed through a period of marvellous jargon, and architecture was deprived of all its feeling and its charm till arts and manners reasserted themselves and reintroduced refinement of expression. Delicacy of outline in mouldings became again striven for, and to a very considerable extent achieved and also unity and dignity of proportions. Neither was a certain, however unconscious, analogy to humanity wanting in this latter case. The comparison of the changes which later architects introduced in the proportional distribution of Nôtre Dame at Paris and Winchester Cathedral is full of interest. In both cases the distribution of an elevation into three nearly equal parts was superseded by giving an importance to one part which decidedly subordinated the rest. Let us indulge ourselves by tracing one more analogy. Every draughtsman knows that lines drawn across a regular face on the upper and lower levels of ear and nose divide it very accurately into three equal parts. And yet is this division so far from being obtrusive as to be latent. The dignity of the composition, so to speak, results from the effect of a conjunction of proportionate unequals, of the face above the line of the brow and below it, as 1 : 2. When the face is seen in profile it is the line of forehead and nose which again compares with the space below, as 2 : 1. The continuousness of this line was insisted on by the Greeks in order to secure the beauty dependent on such proportion.

W. Watkiss Lloyd.

Berlin Technical College. — The official *Centralblatt der Bauverwaltung* publishes a notice showing that 1,043 matriculated and 414 non-matriculated students are this winter attending the lectures, classes and practical courses of the Royal Technical College at Berlin. Of the 1,043 matriculated students, 176 are non-German; of which number 58 fall to Russia, 31 to Norway, 17 to Austria and 10 to England. North America and Luxemburg each have 8, Holland 7, Roumania 6, Sweden and Switzerland each 5, Greece 4, the Brazilian Republic and Japan each 3, Italy, Chili and Servia each 2, whilst Spain, Turkey, the Argentine Republic, Mexico and Siam each have one representative. Of the ten Englishmen, two are studying architecture, two are attending the chemistry courses and the remaining six are working with the engineers. The educational staff of the college consists of 63 professors in ordinary, 29 visitors and 96 assistants. Professor Jacobsthal, of the Architectural Division, holds the title of "Rector" for the year 1889–90, and Professor Schlichting, of the Civil Engineering Division, who held the title for the year 1888–89, being "Pro-rector." The very popular Professor Ende, Hon. Corresponding Member of the R. I. B. A., has not been able to read this session on account of ill-health. — *The Architect.*

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CLEOPATRA'S TOMB.

"All the Modern Improvements." — No. 2.

THE authorities at the British Museum are reported to have received information that a find of extraordinary interest has recently been made on the site of some recent excavations in Egypt. The discovery is nothing less than a tomb which is believed by eminent archæologists to be that of Cleopatra. It was found, according to a statement in the Manchester *Courier*, at a depth of 25 feet from the surface, in a chamber 10 feet long, 2½ feet wide and lofty in proportion. The sarcophagus was built in the form of a pyramid, and covered with exquisite carvings, among them being five female figures, five crowns of laurel and four figures of children. Some of the latter are entirely nude, while others are draped. In the centre of each of the crowns a bunch of grapes is carved. At the time the message was dispatched the discoverers were awaiting the arrival of an Egyptian official, in order that the tomb might be formally opened.

The announcement has naturally been received with a great deal of interest by archæologists in England. An article in the *Daily Telegraph* says of the announcement: "That it is, at any rate, the tomb of an Egyptian person of quality is evident enough from its imposing appearance. It is to be hoped that the permission, when granted, will extend no further than to the opening of the tomb, and that the remains of its occupant will undergo no more disturbance than is necessary for the purpose of authenticating their supposed identity with those of the famous Queen.

"Of late we have had much too many displays of that antiquarian zeal which, when unaccompanied by its due qualification from the feelings of common human piety and reverence, is apt to claim very unscrupulous indulgence. Within the last year or two we have seen, and, we are sorry to say, under high ecclesiastical sanction, violence done to the remains of a great English prelate, venerated by his countrymen of the Protestant persuasion, and actually canonized by the Catholic Church, and it may be fairly thought that, when this has been found possible in England within so recent a period, anything is within the bounds of possibility in Egypt. Cleopatra does not bear quite so revered a name as St. Thomas of Canterbury, but she has no less sacred a right to repose undisturbed in the sarcophagus in which she was 'quietly inurned,' and not to be condemned either to adorn a public museum or to enrich the private collection of some eminent Egyptologist.

"It is hardly probable, we fear, that the formal opening of the tomb will settle any question in which the world is keenly interested in connection with 'the Serpent of Old Nile'; for unless the Queen, if it be the Queen, should resemble that mysterious and, from the feminine point-of-view, fortunate tenant of the vaults of St. Mary Woolnoth, the explorers will not be in a position to pronounce any authoritative opinion on Cleopatra's beauty. Nineteen hundred and odd years of sojourn in an Egyptian sarcophagus are sure to have affected it for the worse, and it is, moreover, not at all improbable that, even in a perfect state of preservation, it might be found disappointing.

"The philosophic author of the dictum that, if Cleopatra's nose had been an eighth of an inch longer, the whole history of the world might have been changed, indulged, perhaps, in rather a gratuitous assumption. Such an observation presupposes that a departure from our ideas of facial symmetry would have been recognized and deplored as such by Mark Antony, whereas, for aught we know, it might have constituted, in his view, a positive addition to her charms. There is abundance of evidence — we need go no further back than two or three hundred years of our own history for proof — that the ideal of feminine beauty may vary greatly between one age and another, and if we now find Mary Stuart's attractions much overrated, so far as we are able to judge of them from her few authentic portraits, what probability is there that we should be satisfied with the graces of Cleopatra? Besides, it is by no means clear that the daughter of Ptolemy Auletes ever had any great reputation as a 'professional beauty.' More than one ancient writer denies her claim to any such distinction, and such of her medals as are extant appear — though here, again, the 'personal equation' of modern taste may come in — to confirm the belief that she was not remarkable for looks. All concur that she possessed great natural abilities, which she carefully cultivated; that she spoke with facility several languages besides her native Greek, and that she was able to make herself most 'agreeable in society.'

"Probably there was something more about her than this — something which eluded Appian and Dion Cassius, and other respectable Dryasdusts of the time, but of which there are traces in Plutarch, and which Shakespeare, the careful student of Plutarch, seized upon with the true instinct of the poet. We cannot suppose that Cleopatra had no other weapons of attack, no other toils of captivation, than belong to any intelligent and vivacious young lady who has been 'well-grounded' in languages, and has enjoyed the advantages of a first-rate finishing school. It is difficult to doubt that she must have possessed a physical 'glamor' also — a '*beauté du diable*,' which is well-known to be the most dangerous variety of feminine looks, and which, in all ages of the world, from the days of Clytemnestra down to those of Becky Sharp, who, it may be remembered, sustained the part of the Argive Queen on one occasion with much credit, has exercised greater power for the infatuation of the other sex than perhaps even the more orthodox and classical fascinations of the Helens of history.

"Cleopatra, at any rate, succeeded in demonstrating her possession of a more potent wand of enchantment — judging by those whom she captivated — than any other mythical or historical heroine of the past. Helen's conquests, after all, and for all their important consequences, will not bear a moment's comparison with those of the Egyptian Queen. Paris was a poor creature, in whatever way we consider him — not by any means remarkable either for bravery in the field or for ability in the council chamber; and, in fact, so far as can be ascertained, he was very much what an American would describe as a 'no-account man' among his peers of windy Troy. Menelaus — the petitioner — was, perhaps, hardly better. He certainly cuts no very conspicuous figure by the side either of Achilles or of his own brother; and the mere fact that the famous beauty contrived to ensnare two such very ordinary admirers proves but little as to her fascinations. Besides which, it must always be borne in mind that she was assisted by the gods, and thus enjoyed an unfair advantage over all competitors.

"With Cleopatra the case was very different. Mark Antony himself, though wanting in the sterner qualities of a leader, was certainly no inconsiderable man, and it must never be forgotten that a much greater personage than Antony fell a victim to the Egyptian's wiles. Julius Cæsar was very 'hard hit' by her at their first meeting in Syria, after the battle of Pharsalia, and as she followed him to Rome with the apparent intention of retaining her ascendency, there is no saying what future she might not have created for herself had not the daggers of Brutus and his fellow-conspirators cut short her ambitions.

"Nothing, however, so forcibly illustrates her mastery over men as the story of her relations with Antony. There is evidence that he saw her for the first time, and was smitten by her, in Egypt when she was barely fifteen years of age, and she was a woman verging upon thirty and charged with the crime of murdering her brother when she appeared before him again and bound him finally to her car. Thenceforth his history became the 'leading case,' so to speak, in the infatuation of love, just as Cleopatra herself became the monumental example of the power of woman over man. 'The World Well Lost' is the second title of that great verse-tragedy of Dryden, which only does not shine out among the brightest lights of our dramatic literature because its rays are swallowed up and lost in the resplendence of its Shakespearean rival, and the later drama has been well-named. A larger stake was never 'set' in history than that for which Antony and Octavius played at Actium; and, though it might be too much to say that the former could in any case have won the day, it is certain enough that all his chances of victory were as completely squandered in the arms of Cleopatra as the famous pearl was melted in the goblet of his paramour. Vast as the sacrifice was, however, it seems natural and plausible to this day. No more picturesque figure than that of the woman for whom it was made has appeared from her own time down to that of Mary Stuart, whom, indeed, she resembles in her bravery, her resource, her passionate temperament, her singular power over men, her dramatic and pathetic death, and, we must add also, in the associations of crime and violence which still cling to her name."

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

CAPITALS FROM THE CHAMBER OF COMMERCE, CINCINNATI, OHIO. MESSRS. H. H. RICHARDSON, AND SHEPLEY, RUTAN & COOLIDGE *Successors*, ARCHITECTS, BOSTON, MASS.

[Gelatine Print issued only with the International and Imperial Editions.]

COMPETITIVE DESIGN FOR FIRST BAPTIST CHURCH, MALDEN, MASS. MESSRS. LEWIS & PHIPPS, ARCHITECTS, BOSTON, MASS.

HOUSE FOR JULIUS HOWELLS, ESQ., RIVERSIDE, CHICAGO, ILL. MR. W. H. PFAU, ARCHITECT, HAMILTON, O.

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INTERIOR OF HALL IN HIS OWN HOUSE. MR. W. REDMORE RAY, ARCHITECT, LOS ANGELES, CAL.

PREMISES OF G. G. BOOTH, ESQ., DETROIT, MICH. MESSRS. MASON & RICE, ARCHITECTS, DETROIT, MICH.

THE CENTRAL DOME OF THE PARIS EXHIBITION BUILDING.

[Additional Illustrations in the International Edition.]

HOUSE OF E. D. PEARCE, ESQ., PROVIDENCE, R. I. MESSRS. ROTCH & TILDEN, ARCHITECTS, BOSTON, MASS.

[Photogravure.]

THE materials used for this house are face-brick for the lower story while the upper story is covered with untinted rough-cast. The woodwork is painted in dark olive green and in spite of, or because of, the great contrast of color, the result in color as well as design is extremely satisfactory, far better than one would be led to expect from the glimpse of the north side which was shown in our issue for January 11.

HOUSE OF MR. MCKENNA, SANTIAGO, CHILI.

[Gelatine Plate.]

HOUSE OF SENOR CUDA, SANTIAGO, CHILI.

[Gelatine Print.]

LLOYDS, TRIESTE, AUSTRIA. BARON HEINRICH VON FERSTEL, ARCHITECT.

[Gelatine Print.]

THE magnificent Lloyd Building, at Trieste, is built in the style of the Italian Renaissance and fronts on a small park opposite the Palazzo Municipale. The rear façade is toward the sea. The lower part of the building is of massive Istrian stone and only the upper portion has been subjected to ornamentation. A finely-sculptured figure of Aphrodite is placed in the niche at one corner above a basin into which is introduced salt water. A companion-basin at the other corner, for fresh water, is surmounted by a statue of Hygieia.

THE VILLA BLANCA, NEAR INNSBRUCK, TYROL. HERR J. W. DEININGER, DIRECTOR OF THE BAUAKADEMIE, ARCHITECT.

[Gelatine Print.]

DESIGN FOR A VILLAGE CHURCH. MR. G. C. HORSLEY, ARCHITECT.

WINDOW IN GRISAILLE GLASS. MR. W. R. LETHABY, DESIGNER.

THE GABLES, FELIXSTOWE, ENG. MR. WILLIAM H. THORP, A. R. I. B. A., LEEDS, ENG., ARCHITECT.

THIS house was built by Mr. Thomas Maw as a seaside residence, and occupies one of the best sites on the cliff at Felixstowe, commanding extensive views seawards and across the estuary towards Harwich. Externally the house is faced with local bricks of a deep red color, and the roof is covered with Broseley tiles. The woodwork generally is painted ivory white, sage green being used for the veranda, which skirts two sides of the house. The ornamental features of the exterior, such as strings, cornices, apron panels, etc., are carried out in moulded, and cut and rubbed brickwork. Internally the house contains three reception-rooms, and the customary accommodation requisite for a gentleman's household.

HOUSE, CLEEVE, GORING-ON-THAMES, ENG. MR. GEO. W. WEBB, A. R. I. B. A., READING, ENG., ARCHITECT.

THIS house has recently been erected on a new building estate of seventy-six acres in course of development, and is beautifully situated on high ground overlooking the Thames Valley. It is proposed to allow an acre of ground or more to each house. The ground-plan is after a similar one published some years ago, and is convenient in arrangement for a small house. The elevation is picturesque in appearance, consisting of half-timber, rough cast, dark bricks and tiles, the cost being exceedingly low for the size of the house.

SEMI-DETACHED HOUSE, RIPON, ENG.

COMMISSION ON A STANDING PARTY-WALL.

Question. Will you kindly inform us through your valuable columns the professional practice in the following instance?

We were employed as architects in the erection of a building to replace an old one standing between two taller buildings. To do so it was necessary to purchase additional party-walls on either side. In this case the purchase of the party-walls was reserved from the general contract, and the negotiations were conducted directly by our clients, with our assistance. The measurer was engaged by us, and we used our best endeavors to get the adjacent property-owners to sell at a lower price than the valuation fixed by the measurer. In Philadelphia the measurer furnishes us only with the valuations of the party-wall to be used, and not with dimensions of wall-surface to be occupied. When we presented our bill to our clients, we included the price paid for additional party-wall in summing up the cost of the building on which our five per cent fee is based. Our clients object to our charging a fee for party-walls. Are we right? Yours respectfully, B. & D.

Answer. You would probably be able to satisfy a jury that a fair compensation for your services would be the usual commission charged upon the cost of the building including the price of the party-walls. There is no "custom" in the case, as architects sometimes seem to think. The whole question is for the jury in each case, and is simply one of fact and of expert testimony as to what is a fair remuneration for the work done. Architects generally could be relied upon to testify that a fair remuneration for drawing plans and supervising the erection of a building is five per cent upon the total cost including the cost of purchased walls; and the chances are that a jury would find a verdict in accordance with such testimony.

If, however, there should be any distinguishing circumstances indicating that the architect and his client agreed to leave the cost of the party-walls out, that would certainly estop the architect from claiming his commission on the cost of the walls. The common agreement, sometimes reduced to writing, that the architect is to have five per cent "of the cost of the work" would, we think, exclude a a claim to a commission on the cost of party-walls already built; for the price that a man pays for the standing wall is no more a part of the "cost of the work" than the price he paid for his land, or for any privilege appurtenant to it afterwards utilized in building. We think that most of the disputes on this vexed question arise from failing to distinguish between the case where the architect has agreed to take five per cent of the actual cost of the work, and the case where he has made no specific agreement of this kind, and is entitled to recover a reasonable compensation for his services. In the latter case he would have little difficulty in satisfying a jury by means of the testimony of his fellow-architects that a reasonable compensation is five per cent on the cost of the entire building including party-walls.

We have sometimes thought that architects in discussing this question fail to appreciate the force of the reasoning that a party-wall which has already been assessed a commission to the architect of an adjoining house should not pay another commission to the architect of the new house. There is of course, in fact, a double commission; for the architect of the second building not only gets his commission on the cost of cutting and altering the old wall, but on the cost of the original construction of it. The whole trouble lies, we think, in treating the compensation of an architect as a "commission." When looked at as remuneration for services, the case wears a different aspect; and it is not very difficult to make a reasonable client understand that there is a good deal of labor involved in finding out about the thickness and character of the wall in its various parts which would not be compensated for if no commission were charged upon the cost of the alterations.

There is probably no case in building operations which gives rise to such frequent misunderstanding between architect and client as this question of a standing party-wall. Like many other disputes the difficulty seems to be due to a conception — justified by the language of the profession itself — of the architect's office as similar to a broker's. If architects are content to regulate their charges by "commissions" they must not be surprised if like insurance or real-estate brokers, they are sometimes regarded as nothing but business go-betweens. Is there any more reason for regarding the compensation of an architect as a "commission" than there would be for thus characterizing a lawyer's retainer or a physician's fee?

THE TORONTO ARCHITECTURAL SKETCH-CLUB.

THIS organization, which was formed last December, is in a prosperous condition. A large and comfortable club-room has been secured in the central part of the city, and it is now the recognized *rendezvous* of the older and younger members of the profession in Toronto.

The club is working on the lines usually followed by students' architectural improvement societies. Its meetings are all informal and social in their character, the lectures and debates being given in a conversational manner. Monthly competitions are held: already a water-color class has been established, and it is expected soon to start other classes.

The competitions are decided by vote of the members, after which a criticism is made on each design by the club critic, Mr. Frank Darling.

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The officers for the year are as follows: *President*, Charles D. Lennox; *Secretary*, A. H. Gregg; *Treasurer*, Ernest Wilby; *Directors*, C. J. Gibson and Robert Dawson. These five form an Executive Committee for the transaction of the business of the club.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE SOLDIERS' HOME BUILDING AT WASHINGTON.

CHICAGO, ILL., February 4, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — On pages 301–302 of your issue of December 28, your Washington Correspondent comments on the architecture of the U. S. Soldiers' Home buildings. The article contains much that is interesting and instructive, but there are several misstatements of fact, and as one of them is personal to myself, I trust you will accord space in your valued journal to this reply, for I am sure you would not knowingly mislead the public or give currency to an unjust criticism of any one.

In your correspondent's judgment the architectural work at the Home may be classed as *good*, *indifferent*, and *positively bad*. The first category embraces the "old main building designed by F. S. Alexander, an engineer and architect in 1853." With one exception it is said to be "pleasing . . . the massing of walls and grouping of windows having been well studied." The "rejuvenated" building — Poindexter's — is also described as "very pleasing, the treatment simple and refined." Smithmeyer's library "has been effectively done, the building being artistic and attractive."

Omitting a citation of remarks upon the indifferent designs — the gate-lodges, the chapel, the president's house, and the officers' quarters — we come to the last class — the "positively bad;" this comprises the hospital, and "Captain Davis's dormitory," but our critic does not give us the name of the culpable designer of the "nondescript" hospital. He learned, however, that the distinguished Army Surgeon, John S. Billings, directed the arrangements for heating and ventilation, which are commended. Why your contributor failed to give the name of the well-known architect in Washington who worked out all the architectural features of this structure that are visible to the passerby is perhaps accounted for — or at least suggested — by the following remarks which might well have appeared as the text of his article — "Here the hands of the Army Engineer is again seen in connection with Government Buildings." He thus goes on in regard to the reputed work of an Army Engineer: "Here we have a good contrast between the abilities of an architect and an engineer as a designer. Poindexter's main building dignified, simple, scholarly, and pleasing in all its outlines and details, Captain Davis's dormitory, a box with porches, fussy little details of cast-iron and jig-saw work, every part badly proportioned in itself and in connection with other portions of the building; the whole finished with an ill-looking mansard roof, that would truly have astonished Mansard. I always thought until I made inquiries that it was constructed by some of the carpenters on the place, probably making their designs as they went along. It never occurred to me that it was designed by one of our learned and scholarly Army Engineers, although it is a building of considerable cost and size." . . .

Let us see if your correspondent has not misstated some of the facts in the case and awarded blame and credit where it is not due — we cannot do better than appeal to the written and public records.

On the 27th of July, 1852, the Commissioners of the Military Asylum (as the Home was then styled) contracted with Gilbert Cameron to erect the T-shaped structure which your contributor refers to as "the old main building . . . designed by F. S. Alexander." The contract referred to contains the following: "that the construction of said buildings and of their appurtenances shall be in every respect in accordance with the plans, specifications and directions of Lieutenant B. S. Alexander of the Corps of Engineers, the architect of said institution." It may seem cruel to metamorphose Mr. F. S. Alexander, Civil Engineer and Architect, into Lieutenant B. S. Alexander, Army Engineer and Architect, for the fabric of the vision was pleasing to your correspondent and consistent with his theory that no good to art ever came out of the military Nazareth — or shall I say Golgotha? Having awarded the design of the parent structure to Mr. Alexander, he proceeds to tell us how Mr. Poindexter "rejuvenated" it, and a little later on Alexander disappears and it becomes wholly Poindexter's.

Pursuing this metamorphosis in the light of the record we find that some ten years ago, the leg of the T of the original structure was extended some forty feet, the same pleasing Norman Gothic design being adhered to, and in 1884, a second extension of the same feature was made, and all in keeping. Before the last improvement was completed, the making of still another enlargement was under consideration by the Board — so rapid had been the increase in the number of inmates and the demand for increased accommodations. All who were consulted as to the matter (and the writer was one whose opinion was asked) urged the addition upon the north of a wing similar in its general features to the old south front except the tower, and so convert the T into an H, adhering closely as to style of architecture to Alexander's general features. It appears that the Board have carried out this idea which was suggested, in a different form, in the plans prepared in 1852, and employed Mr. Poindexter to make the drawings. To whom should be awarded the credit of abolishing the "incongruous French roof, I do not know, but am willing to accord it to Mr. Poindexter, who is well-known as an agreeable, talented and modest gentleman. How a return to the examples of the feudal ages, by borrowing the crenellated battlements, can be said to rejuvenate a building, I fail to perceive. Would it not be more appropriate to say the product was an *antique*?

The general features throughout, the grouping of masses — lights and shades — fenestration — about all save the sky-line are Alexandrian, for which we are indebted to a young Army Engineer, who in later years became famous and achieved a world-wide reputation as the designer of some of the most notable works of engineering-construction in the world.

But the work which is the especial abomination of your correspondent is the dormitory situated just to the west of the library. I am denounced as the person responsible for this vile blight of the otherwise pleasing prospect. Let us again turn to the records and leave nothing to assertion or imagination.

I have before me a letter dated July 9, 1884, and signed by General Sheridan as President of the Board of Commissioners of the Soldiers' Home. The first paragraph is as follows: "The Commissioners of the Soldiers' Home have about completed the necessary arrangements to invite proposals for the erection of a building for occupation of inmates, which it is estimated will cost about $70,000. They desire to obtain the services of a competent officer of practical experience as architect and superintendent, under whose direction the contractor shall erect the building"; and in a letter from the Treasurer of the Home he states that: "The Commissioners directed that the plans and drawings should be made for a building similar to the old annex," . . . which it was to adjoin on the north.

When I entered upon my duties I was handed several sheets of drawings, consisting of floor-plans and elevations, and estimates of cost that I was told had been previously prepared under direction of the Board by a Mr. Henderson, an architect and builder in Washington. The proposed site was pointed out to me and I immediately prepared working and detail drawings and specifications, all conformable to my instructions, and when about to advertise for proposals was notified that the Commissioners had decided to change the location of the dormitory to the prominent site west of the library. I called attention to the incongruous and unsatisfactory effect to be produced by giving the new annex so conspicuous a site, but the Board adhered to its last decision.

Had the building been placed as first proposed its style and appearance would not have been objectionable, as the first location was much lower and partially screened by tall trees and shrubs. I had no alternative but to proceed with the work. While the lower walls were going up, I submitted to the President of the Board my own design for a different roof, which I urged would somewhat ameliorate the ugliness of the structure, but the change was not approved, and the building was completed in accordance with the preliminary plans furnished me. Such is the true history of the designs of "Captain Davis's dormitory" which is cited as an illustration of the incompetency of Army Engineers as Architects.

The Treasurer of the Home in a recent letter writes as follows: "I never go by the building without regretting the change of site. The ventilation is perfect and the piazzas are the delight of the old men. It is the favorite building at the Home and is as solid as a rock, not a crack in it." . . .

I think I have shown that about all that is good in architecture at the Soldiers' Home, was principally the work of one of that reprobated class of public servants, the Army Engineers, and that the responsibility for anything bad cannot be brought home to them by any fair-minded man: but the Corps of Engineers needs no defence at my hand, neither have I the honor to belong to it.

Yours very respectfully,

GEO. W. DAVIS.
(Capt. 14th Infantry.)

MR. WARREN'S SKETCHES AT THE LEAGUE EXHIBITION.

NEW YORK, N. Y., February 8, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — In a recent issue of your periodical your correspondent in this city, reviewing the late Exhibition of the Architectural League of New York, comments somewhat unfavorably upon two sets of sketches contributed by Whitney Warren. Will you kindly permit a dissenting opinion?

In the first place, it would seem to require more than the somewhat hasty and superficial examination vouchsafed by your correspondent to override the verdict passed upon those sketches by so important and responsible a jury as that of the Paris *Salon* (which was the "some French exhibition" to which your critic somewhat slightingly alluded). But their highly complimentary verdict of a "Mention

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honorable," is further borne out by a considerable number of highly favorable notices from leading architectural journals in France, from one of which I copy the paragraph appended to this letter.

That which really gives to these sketches their chief merit, and which your critic has apparently not perceived, is the fact that they are *careful studies, measured and figured*, drawn at least approximately to scale, and showing not merely the picturesque aspect of the objects they represent, but plans and sections at various levels. They are conscientious studies of design and construction, and not mere picturesque water-colors intended to afford a momentary pleasure and to attract the notice of the laymen in architecture. To many besides myself the drawing appeared spirited and yet delicate, and the rendering far from weak, but *de gustibus non est disputandum*. When merely picturesque drawing is so rife among our younger architects, it is rare and refreshing to find one instance of so conscientious and so permanently valuable a use being made of pencil and brush. One such study is worth a dozen picturesque sketches, both to its author and to those who study his work. What the distinguished French critic, M. de Rivoalen, thinks of them is shown by the following extract from the *Semaine des Constructeurs* of May 25, 1889.

Believe me, sirs, yours very truly,

A. D. F. Hamlin.

"Jamais nous ne manquons de taquiner, à la fois, le jury et ses justiciables au sujet des pochades, plus ou moins coloriées, qu'on étale au Salon d'architecture, à côté de travaux sérieux aux quels ces pétards font du tort, sans porter profit à personne, — même à leurs auteurs. Il nous paraît, par contre, lieu juste et raisonnable de signaler les rares croquis pouvant passer pour des études d'architecture: Voici par exemple, de M. *Warren*, — un Américain, — des *Croquis de voyage*, dessinés et lavés finement, consciencieusement (ils sont même côtes). Les *Ponts de Paris*, entr' autres, sont des aquarelles un peu trop pittoresques, encore, mais accompagnées, en marge, de croquis géométraux à peu près mis à l'échelle. Voila une bonne petite récolte de touriste. . . . . Ce sont la de charmants souvenirs, pouvant faire revivre, chez l'auteur la vision des choses aperçues trop rapidement."— (E. Rivoalen, in *La Semaine des Constructeurs*, May 25, 1889).

ABATTOIRS.

New York, N. Y., February 24, 1890.

To the Editors of the American Architect:

Dear Sirs, — Allow me to suggest in the matter of abattoirs that the rating schedules for packing-houses, etc., which can be obtained from the Boards of Underwriters of St. Louis or Chicago, might be of service in showing points to be avoided. Insurance maps and surveys of Western packing-houses are probably available in the offices of the leading companies, from which a general idea might be had of the arrangements.

Respectfully yours, B.

NOTES AND CLIPPINGS

Frederick the Great's Tomb. — Professor Sello, who was commissioned by the Emperor Frederick to examine the history of Potsdam and Sans Souci, gives the following reasons why it would still be well to lay the remains of Frederick the Great in the spot once chosen by himself, and place there a mausoleum worthy of his memory. When Frederick the Great died, in August, his body was hastily buried on account of the great heat in the Garnisonskirche, before his successor, Frederick William II, had been able to become acquainted with the contents of his will, which was not opened till the day after the burial. It was then found that Frederick the Great wrote: "Bury me in Sans Souci on the top of the terrace in a vault which I have had prepared for me," and "Should I die during war or on a journey, then bury my body in the next best place and let it be transferred to the above-mentioned place in Sans Souci in winter time." The wish to be buried there had been expressed by the King during his lifetime, and the fact that the terms of the will were afterward kept secret seems to show that their neglect by the Court had been disagreeably noticed, but explained away by "reasons of State." When, in 1791, an indiscretion betrayed the facts of the case, it was declared that a vault on the terrace did not seem dignified enough. The artistic marble coffin which Frederick the Great had wished for was never made. The vault on the east side of the uppermost terrace at Sans Souci actually exists, and is about twelve feet long by six wide, and more than six feet high. Above it there is a statue of Flora, by Adam, which was placed there in 1749. In a semicircle to the east stand copies from the antique of Cæsar, Augustus, Tiberius, Caligula, Claudius and Nero. Professor Sello thinks the place well adapted for a small domed mausoleum. — *New York Times.*

Dr. Schliemann *vs.* Dr. Botticher. — The truly and in more senses than one Homeric combat about Hissarlik in the Troad between Drs. Schliemann and Botticher, has led to an arbitration. The questions whether Dr. Schliemann tampered with the excavated ground at Hissarlik and whether the site of a town discovered there is really a cemetery have been settled in the negative. These Doctors of Archæology have met on the *terrain* with their seconds, who are noted experts, and Dr. Botticher has withdrawn handsomely both of his aspersions on the intellect or the truthfulness of the great excavator of Troy and tombs. — *New York Times.*

TRADE SURVEYS

It is only a question of time for producing-capacity to overtake consumptive-capacity, and for an accumulation of stocks of all kinds to interfere with healthy trade conditions. For reasons frequently pointed out, the future fluctuations of production and of the volume of surplus products, will be less than heretofore, and the damage done thereby will be of shorter duration. Manufacturing and commercial interests have been preparing for this emergency, more through an instinctive knowledge of its coming, than through any intelligent conception of the causes which are quietly at work bringing it about. The hope has been entertained that we have seen our last commercial depression, and that hereafter improved methods of production and distribution and wider markets and a greater familiarity with the requirements of the world will make panics and depressions next to impossible, or at least make their periodic recurrence less frequent. It is very true that the agencies which have gained supremacy within the past ten or twenty years are working in that direction, and that for the future the ups and downs of trade will be more regular, and the disasters less disastrous. Much of the improvement grows out of a study of the world's wants. Trade has long since emerged from its feudal conditions, so to speak; organization after organization and defeat after defeat and mistake after mistake have cleared the way for an intelligent advance into the higher fields of commercial activity. The world's business men have put in a long apprenticeship in learning how to do business. Of late years the governments of the world have become the coadjutors of the merchant princes, and both have been acting in harmony in the way of extending commerce and building up colonies, and planting the seeds of empire in the forgotten corners of the world. The British Government is, to a very large extent, simply a police force to enable its business men to wage successful commercial warfare, and to enable its kings of finance to collect interest on bonds negotiated in England. This commercial spirit has seized the controlling powers in the Governments of Germany and France, and of little Belgium and of Portugal. These new efforts of the European governments to extend their control and establish new empires in new lands, are all a part and parcel of the great underlying agencies that are seeking to extend trade and commerce throughout the world. The United States has done very little in this direction. It has its own empire at home to develop, and its energies for thirty or forty years have been wholly absorbed in the grand work of developing and utilizing the extraordinary resources that genius and enterprise find on every hand. From the progress that the nations of the world are now making, it is clearly evident that still newer and wider fields must be found wherein the surplus energy and capital and enterprise can find working-room. The United States Government and its people have made more rapid progress than the other governments, simply because they could reach new territory and new resources on foot, by canal-boats, by rivers and by rail, while the outside nations of the earth had to equip navies and build up a merchant marine wherewith to reach the more remote fields for the planting of enterprise. Hence it is, that the progress which we have made within the past two or three decades, has been the wonder of the world. How long this grand progress can be kept up on the old lines, and by the old methods, is the query of the hour. We have borrowed our financial system from Europe; we have borrowed its trades-unionism, and we are in a certain sense adopting its land system and are not escaping the evils of enormous taxation; but for all that, with the unlimited resources at our command, we have made commendable progress in solving the great problem of how best to use the latent energies of man, to secure the highest and best and most immediate fruits.

The most careful students of our American systems of activity, and the most careful observers of the developments that we are making, all seem to think that there will be such gradual modifications from time to time of older methods and older machinery as will enable us to not only hold all the advantages which our activity has brought to us, but to gain still greater advantages. The immediate danger in front of us, according to the opinions of many who try to see a little farther ahead than others, is that the capacity to consume will not keep pace with the capacity to produce. On this point hinge the most mighty interests. To a very great extent, the outside world will be able to take care of itself. We may by persistence be able to find a foreign market for ten to twenty per cent of our products, but the great bulk of our productions must remain at home. No doubt this is as it should be, but the fact creates a probable difficulty which our present conceptions as to what our interests demand do not enable us to see our way through. These observations are particularly applicable to the present commercial conditions We are threatened with over-production. Already, in a score of trades, the leaders are asking: "Whence will come our future markets?" The iron-makers have given us a ten-million-ton capacity per annum; the ten or twelve thousand new industrial establishments started last year have now their wheels turning, and are filling up their warehouses and shops in anticipation of a sufficient market. Whatever the markets may be, there are mouths enough to fill and bodies to cover. There is machinery enough to more than supply all reasonable and probable wants. There are sufficient wheat, corn and cotton fields to produce all that will be needed. There are mines, and sufficient mining-machinery, to furnish fuel, ore and precious metals enough for all needs. The real question at issue is: How can a steady and profitable distribution be effected? That brings us to the most practical question of the age. The mechanic and the cultivator of land have done their duty: their products fill the market-places of the world. The American people have taught the people and the governments of the world one very valuable lesson: viz., that popular government can be maintained, and it is probable that this same people will have the task of demonstrating to the world that a new and better economic system than has ever yet been recognized can be successfully developed and applied, and that in its structure and fibre it will be as different from the older economic doctrines as our present form of popular government is different and distinct from the older forms of government. The thinkers of the present age are thinking in this direction. This is no idle question. It is a burning one in the minds of our most careful students. On its successful solution very greatly depends the permanency of our form of government. Government is now extremely utilitarian. Every year makes it more so. Dom Pedro left Brazil to make room for practical men, or, at least, for men who think they can use government to better push their material interests. The same thought and feeling is rising up everywhere, and is the ghost that stands behind many a European throne. On the standard of every agitator who is calling for broader liberty at the hands of his ruler is the inscription, which the ruler is expected to answer, "*Cui Bono?*"

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Design for First Baptist Church
Malden Mass.

Lewis and Phipps Architects,
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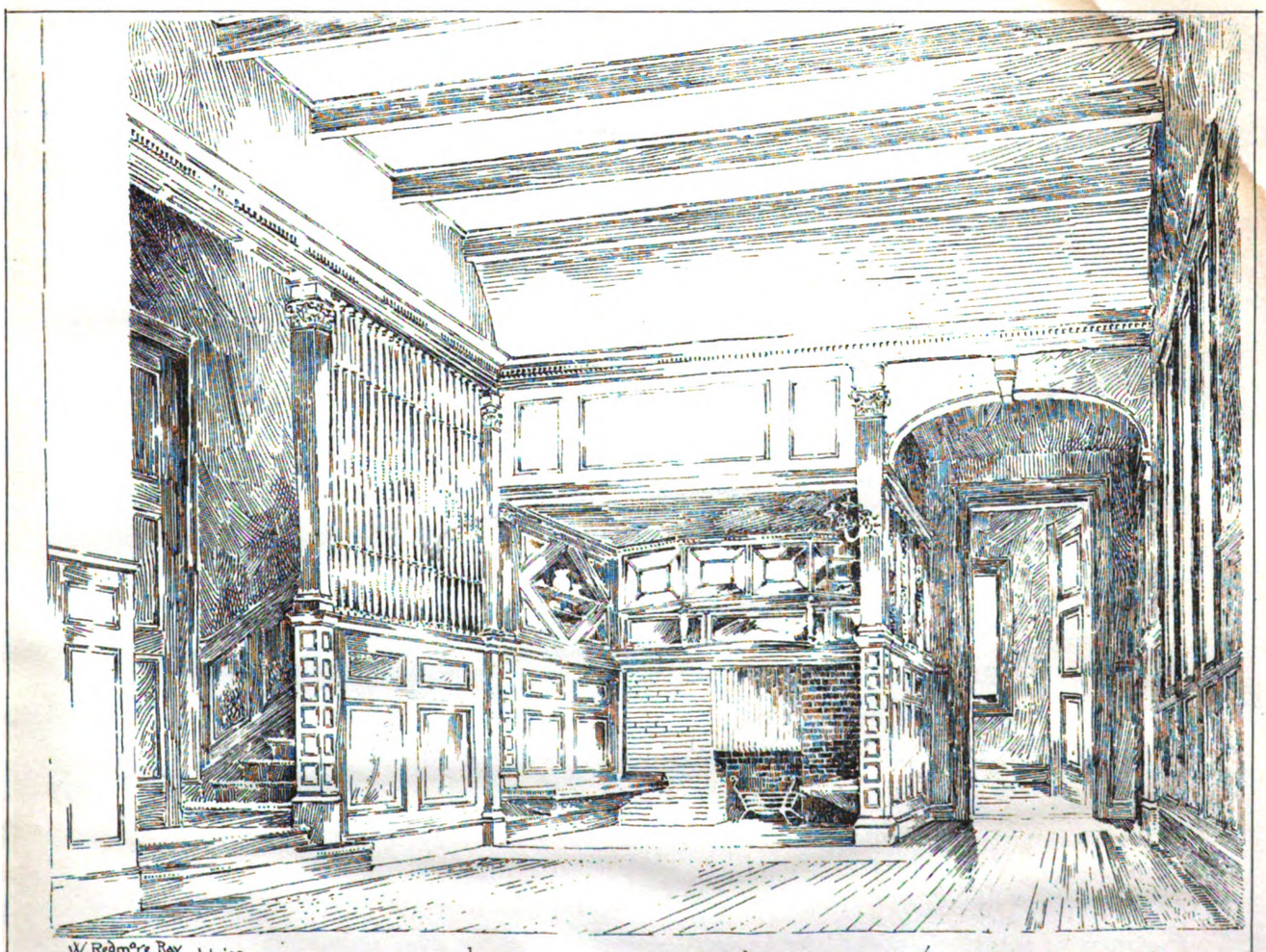
House for Mr. Julius Hoerth
at Riverside. Chicago.
Wm. H. Mac. Archt



W. Redmore Ray July '89.

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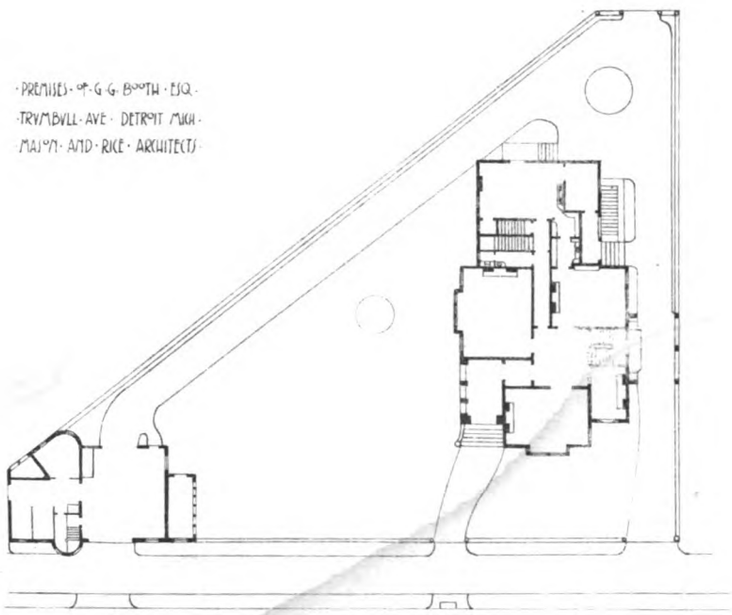

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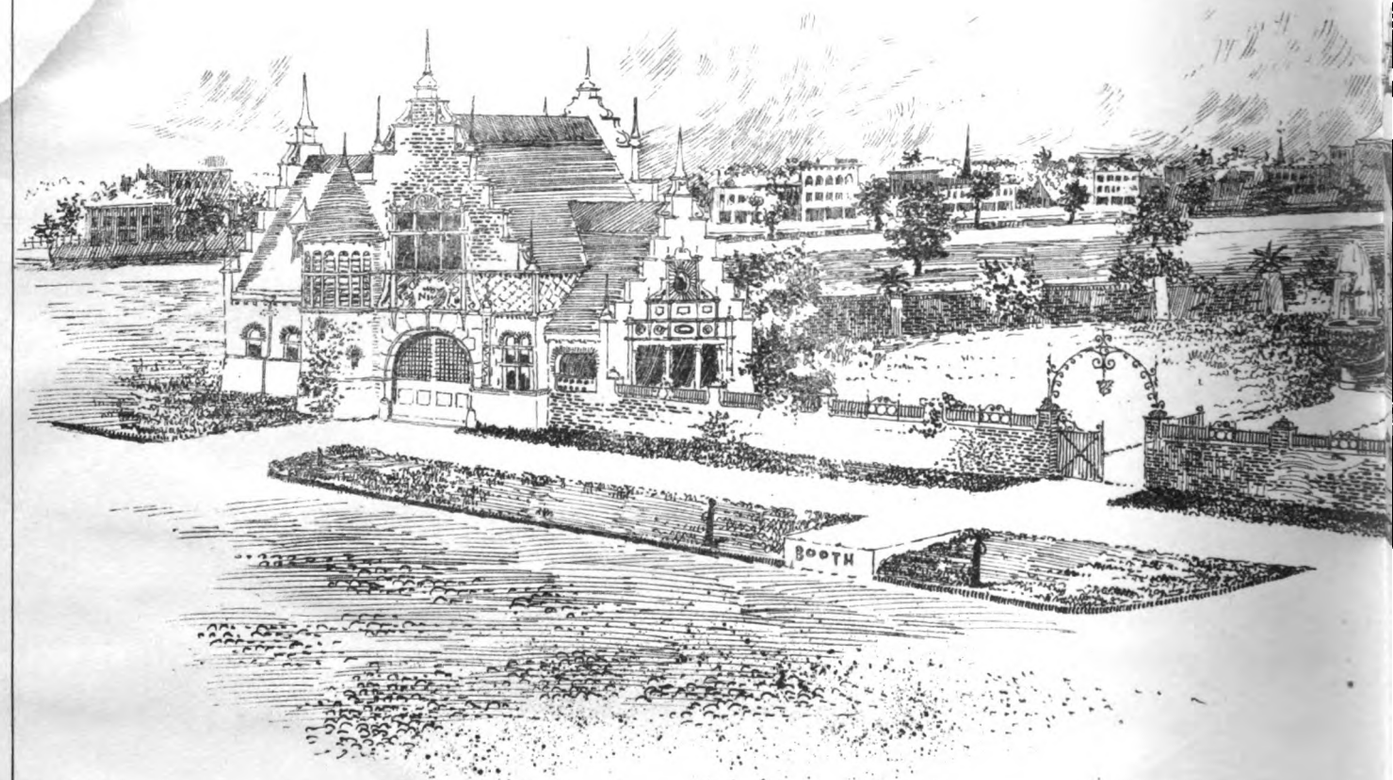

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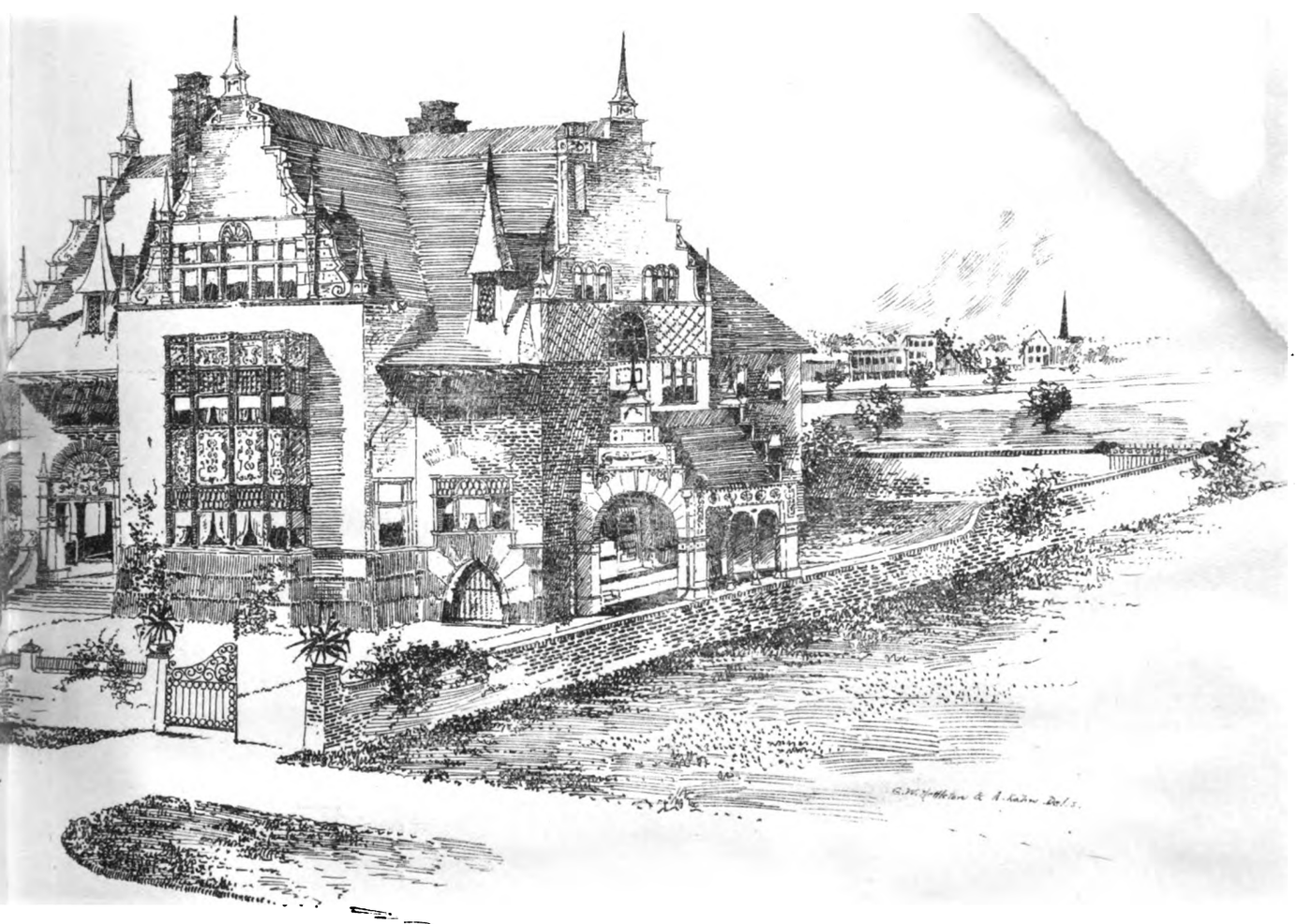

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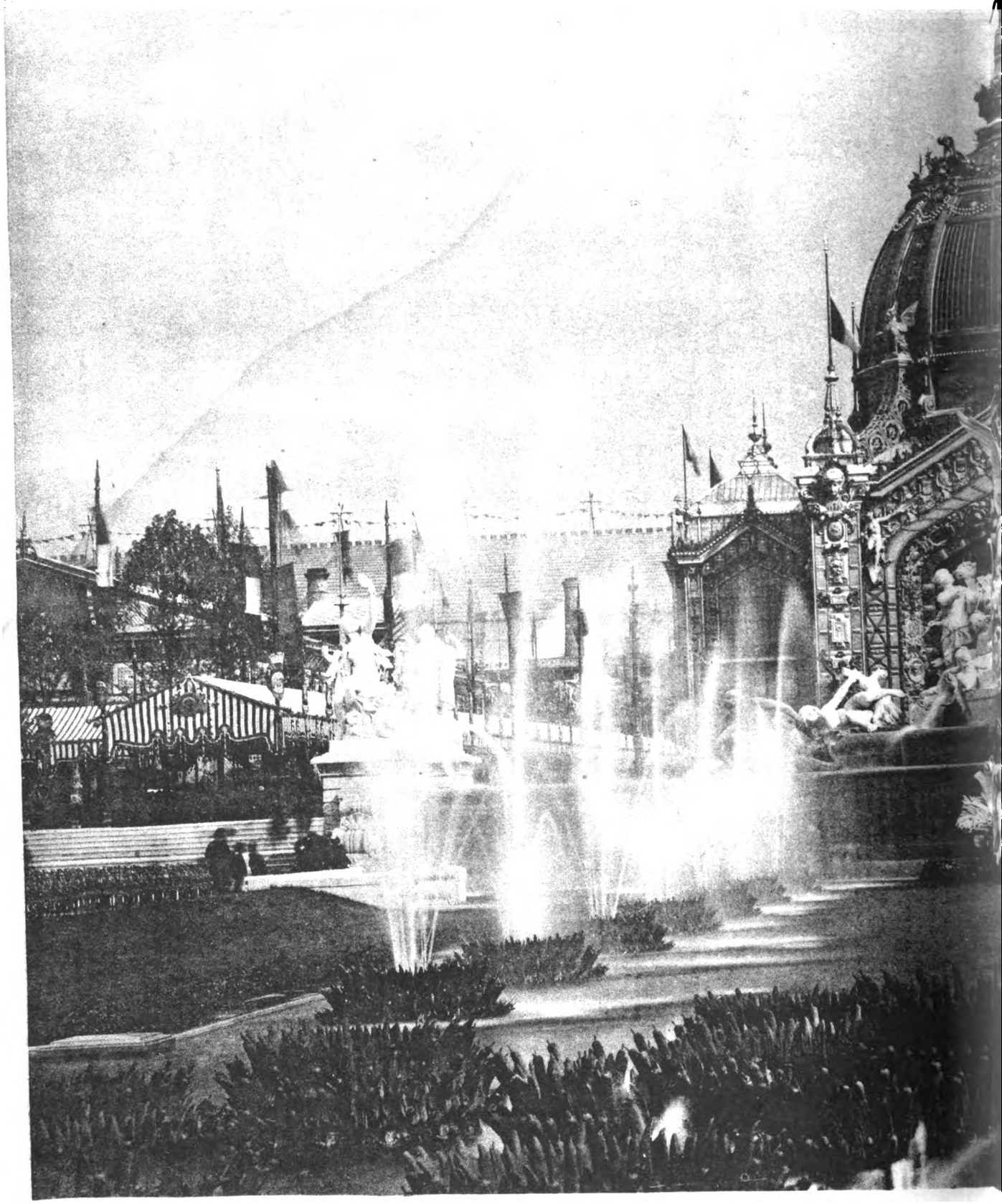

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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MARCH 8, 1890.

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IT is with very great regret that we learn of the death of M. Jules André, one of the most distinguished of the great architects who have made the teaching at the Ecole des Beaux-Arts in Paris famous throughout the world. M. André, who, although more than seventy years old, was in active charge of his *atelier* until the time of his death, had devoted nearly all his life to teaching, and his executed works are few, although they show that originality and fire which he was so successful in communicating to his pupils. It is interesting to remember that the great American master, Mr. H. H. Richardson, was for seven years a favorite pupil of André's, who showed him great personal kindness, and, although Richardson came from the School of Fine Arts a Classical designer, his most original Romanesque work, after he had chosen a more congenial style, often recalls most curiously the elements of strength, simplicity and breadth of light and shade, on which André insisted, and which appear in his own designs, and in those of his other pupils, under Classical clothing. André was idolized by his pupils, and was, in return, warmly attached to them, and his kindness and enthusiasm won for him friends and honors all through his life. He had the rank of Commander of the Legion of Honor, almost the highest that Republican France can bestow, and was also a Member of the Institute and Inspector-General of Civil Buildings.

THE annual meeting of the Grant Monument Association was held in New York recently, and the most interesting business transacted was the examination of the competitive designs and the reading of the report upon them prepared by the expert jury. Every architect will remember the unsatisfactory character of the circular of invitation, and it is refreshing to find that the jury, which consists of Messrs. N. Le Brun, George B. Post and James E. Ware, and Professors William R. Ware of Columbia and Solomon Woolf of the College of the City of New York, say, without circumlocution, that the results of their examination show that the terms of competition "did not offer sufficient inducements to lead men of established reputation and experience to undertake the labor and expense of preparing drawings," and that, in consequence, "only a very few of the schemes submitted are worthy of serious consideration." As it was necessary to award the prizes, five designs were selected out of the sixty-five submitted, and the names attached to them will show plainly enough that, as the experts say, the terms of competition did not warrant any great outlay of time or study on the designs, so that even the best of them "consist either in a general plan which is good, coupled with details which are commonplace, if not actually bad; or radically bad general schemes, with well studied and rendered details." The first place among the five is awarded to one of the two designs submitted by Cluss & Schulze, of Washington, who receive the very inadequate premium of fifteen hundred dollars; the second place, with one thousand dollars, is assigned to Mr. J. Philip Rinn, of Boston, the designer of the Bennington monument; the third, with five hundred dollars, to Haran & Werkelmann, of Leipsic, Germany; the fourth, with three hundred dollars, to Mr. J. A. Schweinfurth, of Boston; and the fifth, with two hundred dollars, to Mr. Herbert A. Gribble, of London, the well-known architectural draughtsman and designer of a few years ago, and now the architect of the beautiful Church of the Oratory at South Kensington. The report of the experts was very favorably received, both by the Executive Committee and the Association, which declared the first competition closed, but voted that the payment of the premiums should not commit it to the adoption of any of the designs. It is said to be probable that a second competition, better arranged, will be invited later. Meanwhile, the monument fund has grown to nearly one hundred and forty-two thousand dollars, and an effort is to be made to obtain further contributions on the occasion of General Grant's birthday, which occurs on the twenty-seventh of April.

THE *Gran Plaza de Toros*, in Paris, where innocent bull-fights were exhibited with great success through the summer and autumn, has now been transformed into a "real ice" skating-rink, after a fashion which seems to be new in France, although it is tolerably familiar here and in England. As arranged for bull-fights, the circular arena, containing nearly thirty thousand square feet of surface, was open to the sky, but, as this would obviously be unsuitable for winter, a roof has been put over it, framed with straight wooden lattice girders, meeting in the centre, and joined and stiffened laterally by purlins, and covered with a thick cloth, in colored patterns, treated with oil in some way, to make it waterproof. To prepare the floor for skating, a thick layer of concrete has been put over it and perfectly levelled, and on this is laid a network, containing ten miles of iron pipes, through which is pumped, according to *La Semaine des Constructeurs*, liquid ammonia, the vaporization of which in the pipes produces cold intense enough to freeze the water which is allowed to stand over them to a depth of about seven inches. It seems not impossible that the liquid flowing in the tubes is really glycerine, or perhaps alcohol, previously chilled by ammonia, instead of the liquid ammonia itself, the vaporization of which might be difficult to control; but, however that may be, the system of circulation is worth remembering. As all the pumps for maintaining the circulation are at one point, on the side of the arena, all the pipes must start from that point. There are fourteen distinct coils, or "circulations," as our steam-fitters would call them, and each coil makes fourteen circuits before it returns to the pumps. As the diameter of the arena is about one hundred and sixty-five feet, this brings the rows of cooling pipes only about five inches apart from centre to centre, and the water is very quickly and uniformly frozen. The room is brilliantly lighted by electricity, furnished by the surplus energy of the engines which drive the pumps, and it is said that the portion devoted to the spectators is intended to be warmed by means of ten thousand cans of hot water distributed among the seats, while twenty charcoal braziers around the ring will enable the skaters to warm their hands. M. Chevallier, of Nice, writing to *La Semaine* about the matter, says that in 1876 he went to England, where he examined a similar ice-rink at Chelsea, the water in which was frozen by means of glycerine and sulphurous acid traversing copper tubes. This rink was a private one, being maintained and used only by two very aristocratic associations, the Ice Club, consisting of twenty-seven members, all gentlemen, and the Glaciarium Club, with forty-seven members, about half of whom were ladies. The club assessment in each case was fifty dollars a year, and this entitled the member to two hours' skating a day in the rink. Several persons belonged to both clubs, and had

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four hours' skating a day in consequence. Each member enjoyed the right of bringing two spectators with him, who were, however, obliged to pay sixty cents apiece for their seats. The rink was a very small one, but the effect of size was cleverly obtained by means of mirrors, extending to the surface of the ice, and scenery, painted to represent a snowy landscape. Another rink was at the same time advertised in London, intended to be open to the public, but it proved a total failure, the water in it refusing to freeze. Three or four successful ones were, however, established in other towns in England. About the same time, a similar rink was, as many of our readers will remember, set up in New York, in Gilmore's Garden, if we are not mistaken, which proved very popular, although our recollection is that the ice was not all that it might have been.

WE are glad to have a very kind answer in the *Spectator* to the inquiry which we suggested some time ago, whether it was, or was not, true that insurance companies would refuse to pay losses by fires occurring in small towns, while the town fire-department was absent, assisting the department of some neighboring community. The *Spectator* says that this question comes up regularly every three or four years, and it has been informed, since we asked it the last time, by the presidents of several prominent New York fire-insurance companies, that the matter is so well settled that they did not care to be mentioned by name in the reply. Their unanimous opinion was that in such an event the liability of the companies "could not, and would not, be disputed," and that "the policies would be paid without question." As to whether the absence of the usual extinguishing apparatus constituted a change in the circumstances affecting the risk, within the meaning of the usual clause in the policy, the presidents said that the policy clause referred only to changes "in the construction, equipment and occupation of the building insured, or in the environment." The individual insured "has no personal control over the public fire-apparatus," and "there is no contract between the company and the town," the underwriters simply making the best estimate of municipal arrangements that they can, before fixing the premium rate. This is quite reassuring, and we are sure that architects, to whom fire-insurance affairs are matters of serious importance, will be pleased to have the question so satisfactorily settled.

FIRE AND WATER has a singular idea of architects. Speaking of the fire in the palace of Laeken, near Brussels, it says that "the architects who, under the direction of Queen Maria Theresa, planned the building, had put several whole oak-trees bodily into the walls of the chimneys, a performance about on a par with the habits of some of our architects, who let the ends of floor-beams extend into the flues." Now, in regard to the antics of "architects" who build oak-trees into the walls of chimneys, and do their planning "under the direction" of Queens, we have nothing to say, such performances being altogether beyond our comprehension; but the "habits" of American architects are tolerably well-known to us, and we say with confidence that there never was one, and probably never will be one, who "let the ends of floor-beams project into the chimney flues," or who did not provide that the contractor should agree not to do so, or who did not, if he saw the contractor's agents violating the agreement, call their attention to the requirements of the contract. The men who build floor-beams into chimneys are journeymen carpenters and masons, not architects. As a rule, they do such things out of pure incapacity for thinking what they are about, or for reflecting on the consequences of their stupidity. Occasionally, they do them under the compulsion, and with the assent of a dishonest contractor, who hurries them along, without allowing them time to think, or thinking or caring himself, whether the work is properly conducted; but no architect in America ever yet planned to put woodwork into flues, or gave permission to the contractor to do so.

THE *Wiener Bauindustrie-Zeitung* gives some useful information about painting on surfaces plastered with cement. As every one knows, oil-paint on a cemented surface is likely to be thrown off by the formation of crystals beneath it; while, if it stays in place, it usually presents a mottled appearance, owing to the unequal absorption of the oil from the paint by the cement. The common way of remedying both these difficulties has been to wash the cement surface with acid before painting it. This dissolves any crystals that may have formed, and acts upon those spots in the cement which have become slightly carbonated by the action of the atmosphere, so as to restore the absorbent quality, which the formation of a superficial carbonate tends to diminish. Where acid is used, it should be sulphuric acid, made very dilute. Muriatic or acetic acid, which are often employed, leave the cemented surface impregnated with chloride of calcium, or acetate of lime, both of which are very deliquescent, and, by keeping the surface damp, prevent proper adhesion of the paint. A better application, even than sulphuric acid, is, however, to be found in carbonate of ammonia. The crystals of the ammonia carbonate should be exposed to the air, until they effloresce partially into a white powder, which is a bicarbonate, and more suitable for the purpose than the original carbonate. One hundred grammes of the ammonia salt — about a quarter of a pound — should be dissolved in nine quarts of cold water, and the cement surface washed with the solution. As soon as it is dry, the paint may be applied, and will adhere well, and resist the action of the atmosphere. The carbonate of ammonia is best applied when the cement surface is about three weeks old. For preparing surfaces, perhaps older than this, or more exposed to the weather, silicate of soda is sometimes useful. This should be prepared by dissolving the syrupy silicate of soda of commerce in four times its bulk of water. Three coats should be applied, and, after the last, the wall must be thoroughly washed, so as to remove every trace of silicate from the surface, or it will effloresce, and throw off the paint.

THE same excellent journal gives a recipe for a cheap paint, which will for a long time prevent wood to which it is applied from rotting, even in the ground. The paint is made by putting fifty parts of rosin, forty parts of ground chalk or soapstone, three hundred parts of sand and four parts of linseed oil into an iron pot, and adding, after the mixture is hot, two parts of sulphate of copper. The whole is to be well stirred, thinned with linseed oil if necessary, and applied hot with a brush. The wood to which it is applied is better unplaned, as the rough surface of sawed lumber holds the paint more tenaciously. The appearance of the paint is not unpleasant, and it is extremely durable, while, applied to fence-posts and other woodwork buried in the ground, it prevents rotting for a long time.

SIR FREDERICK LEIGHTON, in an address delivered to the students of the Royal Academy upon Spanish architecture and sculpture, made a suggestion which would occur to a painter more quickly than it would to an architect, but which is well worth remembering by the latter. Speaking of the churches of Catalonia, which are remarkable, even in Spain, for the smallness of their windows, and the darkness of their interiors, he expresses the opinion that this darkness was intended by the architect, and that it was by no means a mere shading of the interior for the sake of coolness, but a highly-studied device for obtaining picturesque effects of lighting in the interior. In the Cathedral of Barcelona, particularly, which he mentions as one of the most solemn and impressive in effect in Spain, an octagonal lantern is placed over the western bay of the nave, so that the visitor, on entering, finds himself in a flood of light, beyond which stretches the long, sombre nave, terminating in part at the choir, which, as in all Spanish churches, is raised very high above the nave floor, thus making the service at the altar, even in the darkness, extremely conspicuous, while the still deeper gloom of the eastern portion of the sanctuary completes the effect. We should pity an architect who, in his artistic zeal, should design an American or English church in such chiaroscuro that the people could not read their prayer-books equally well in any part of it, but even under this condition, there would be opportunity for many beautiful effects of contrasted light and shadow which have never yet been dreamed of.

THE Art Club of Philadelphia is to hold an exhibition of architectural drawings, decorative sculpture, and so on, from March 27 to April 17, at its club-house, 220 South Broad Street. Architects from all parts of the country are expected to contribute drawings, and the exhibition will have much interest.

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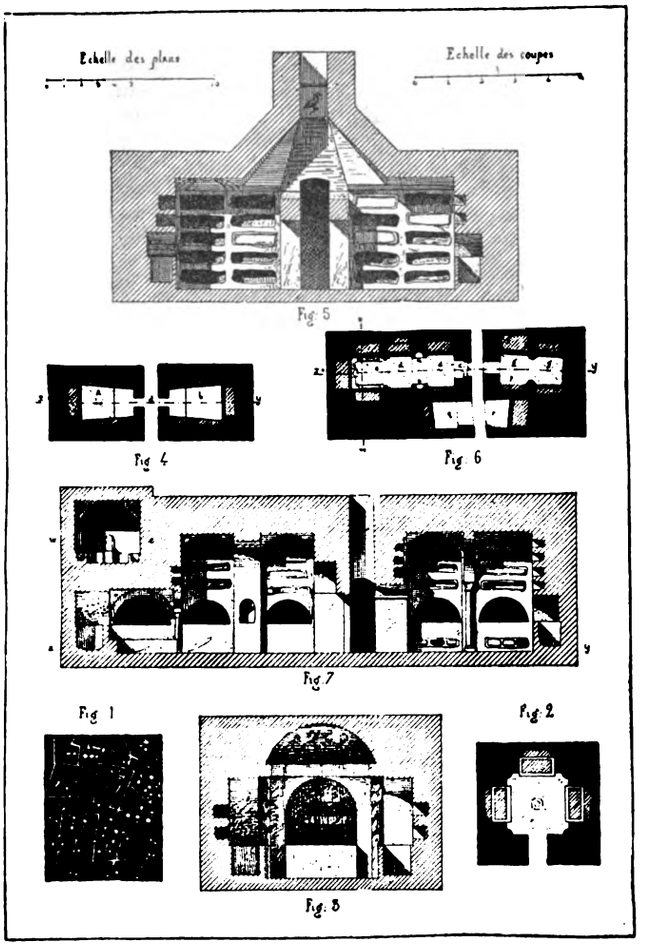
FUNERARY ARCHITECTURE.[1]—IV.

THE PRIMITIVE CHRISTIANS.



Catacombs.

FORCED by persecutions to flee to abandoned quarries for a chance to hold their religious gatherings, the primitive Christians did not fail to make use of these subterranean retreats as burial-places for the remains of their martyrs. Bestowing upon these henceforth sacred relics a worship far more materialistic in character than that accorded to the dead by their pagan contemporaries, and urged on by the very human desire to take a course opposed to that of their persecutors, they renounced the practice of cremation: it must also in justice be admitted that the custom had already fallen somewhat into disuse.

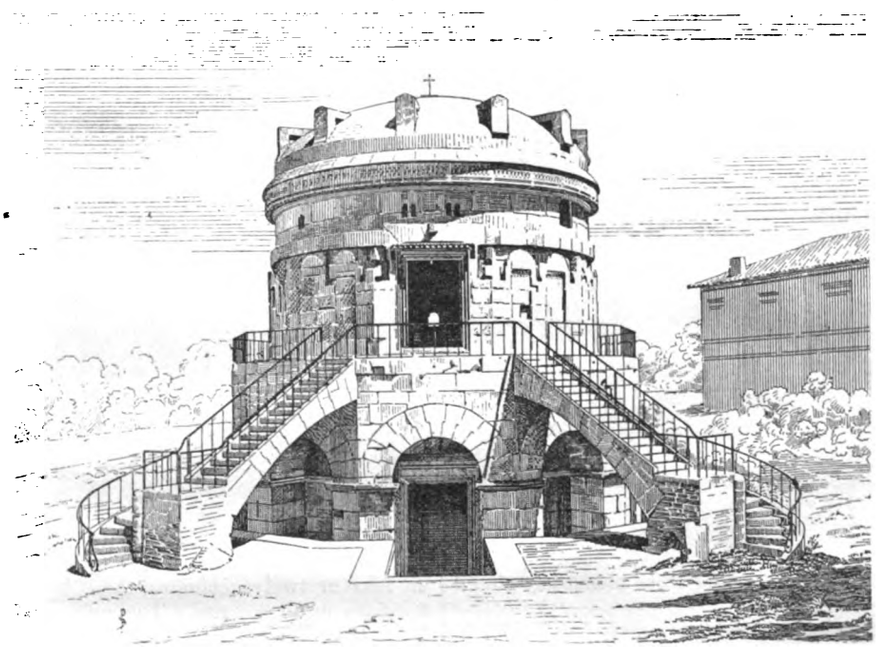
These circumstances were destined to give birth to what has been styled Christian art, and which was, at least in early times, nothing more than a degraded form of Roman art accompanied by new symbols. It is in the catacombs in general, and in those of Rome in particular, that we encounter the results of the first attempts of Christian art.

Certain authors affirm that the catacombs were wholly excavated by the Christians. There is, however, good reason for assuming that they took advantage of the galleries of old quarry workings, and that their work was limited to making these more symmetrical and adapting them to new purposes. An inspection of the accompanying plan of a part of the Catacombs of St. Agnes [Catacombs, Figure 1] shows that they constitute an intricate network of narrow galleries; these are 13 or 14 feet high. In the walls are roughly cut cells, each containing one body, and in some cases two, three, or even four, bodies. Archæologists have termed these graves *loculi;* they were closed by marble slabs or by huge tiles rudely cemented together with an ample supply of mortar. The barbarous inscriptions, formless *graffiti* traced on them, prove abundantly how few resources were at the command of these clandestine grave-diggers. In some places there are five or six tiers of *loculi;* the number of bodies thus buried has been estimated at six millions.

Here and there, recesses of different sizes, called *cubicula* or crypts, open on the galleries; they are named major or minor according to their dimensions. These crypts were evidently excavated by the Christians: they exhibit peculiar arrangements and are decorated with carvings or with paintings frescoed on the stucco coating of the tufa walls. They doubtless served not only as tombs for Christians distinguished by their virtues or by martyrdom, but also as meeting-places for religious services and for Eucharistic celebrations. We give three different examples of these crypts.

Under the name of *arcasolium* are designated the burial-places capable of holding several bodies, cut, like the others, into the tufa and divided into several compartments; this term was applied to them because, above the marble table which serves as a cover to the graves, there is a niche, or rather a deep semicircular arch, likewise executed in the rocky mass. The rear of the niche is usually occupied by *loculi.* In Figure 2 the *arcasolia* and the *loculi* are readily distinguished. In Figure 6, *c* designates the entrance to the major crypt [the jambs of this recess are of travertine], *d* the assembling-place for the men, *e* the choir reserved for the officiating priests, *g* the minor crypt assigned to the women, *h* the pontifical seat, *i, i* sarcophagi serving as seats for the acolytes, and *m, n* niches for statuettes. The flooring of the crypts still shows traces of mosaic tiling: each bay is occupied by an *arcasolium.*

Sarcophagi are sometimes found in the catacombs with decorations after pagan subjects; whether sarcophagi from other tombs were utilized, or whether such articles formed then as now a part of current commerce, apparently no effort was made to efface the heathen symbols which were so out of harmony with the Christian faith.



Tomb of Theodoric.

If the *arcasolium* which we have just described was the indisputable prototype of the first Christian altars, we believe we may safely say that the crypts of the primitive churches (the *confessions*), were unquestionably only a survival of the catacombs.

When persecutions ceased, the custom of interring the dead in the catacombs was still maintained, and it was only gradually that recourse was had to other ways of sepulture.

The first centuries of Christianity were far from fruitful; owing to the prevailing barbarism scarcely any funerary monuments worthy of notice were erected. We must come down to the sixth century to discover the earliest important tomb due to Christian art: we refer to the remarkable tomb of Theodoric at

[1] From the French of Pierre Benouville in Planat's "*Encyclopédie de l'Architecture et la de Construction.*" Continued from No. 740, page 135.

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Ravenna. Our illustration renders a detailed description of it unnecessary. The enormous dome covering the decagon is a monolith; the stairs are, of course, modern, and there is good reason for supposing that the upper story, which held the sarcophagus, was inaccessible. On the exterior walls there are traces of arches which have disappeared. The interior is cylindrical in

Mausoleum of Taghlak.

shape, and it was doubtless decorated with mosaics. Although the monument is of mediocre dimensions, its proud, wild aspect produces a most profound impression on the beholder.

In this same city of Ravenna also exist the interesting Tombs of Galla Placidia, of her brother, the Emperor Honorius, and of her second husband, the Roman general Constantius. The three enormous sarcophagi are placed in a small edifice in the form of a Greek cross, the walls and vaulting of which are covered with admirably-preserved mosaics. This structure, which antedates by nearly a century the one just described, recalls in its arrangements and appearance certain crypts of the Catacombs.

The Tomb of Galla Placidia was not destined exclusively for burials; it was likewise a chapel dedicated to SS. Nazarus and Celsus.

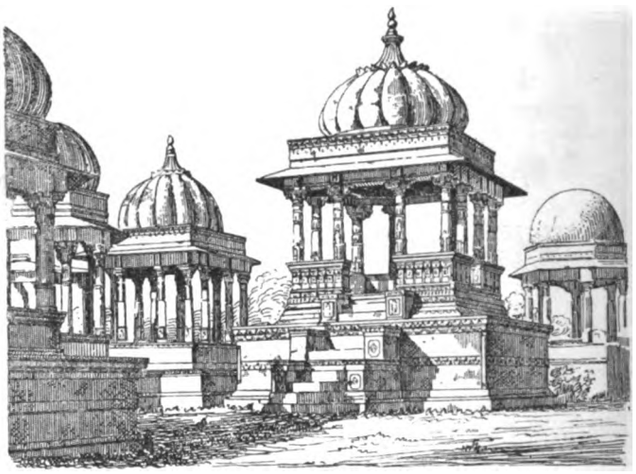
We are already nearing the period when tombs cease to be isolated constructions, and become simple memorials placed in the interior of religious edifices.

Before entering upon this period, it seems advisable, in order to complete the study of purely sepulchral monuments, to glance at the funerary architecture of the Eastern Asiatic nations and of the peoples that became the ardent and fanatical defenders of Islamism.

INDIA.

There are certain very ancient monuments in India which seem to belong to the Buddhist period. They are known under the name of *topes*, and consist of huge *tumuli*, generally built of brick, and surrounded by an enclosure. Are the *topes* tombs? Although they have every appearance of being such, the question has been a matter of dispute among scientists who have made a special study of Indian archæology. No one however, has apparently reached any very decided conclusions, and we certainly shall not essay a solution of the problem. In some parts of India, and notably in Ceylon, there are monuments quite strongly resembling these, and known as *dagobas*, which are unquestionably sepulchres.

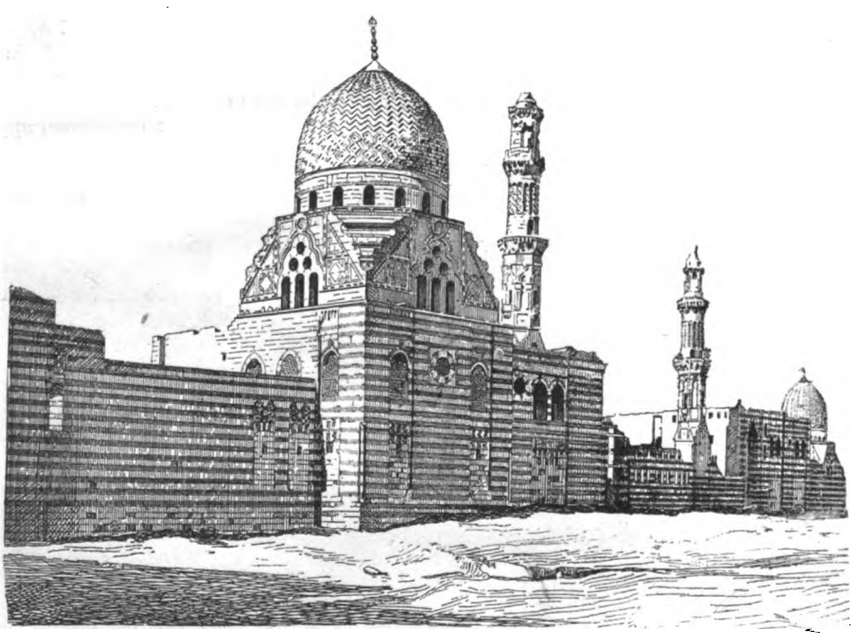
Whether owing to the Hindoo custom of throwing the dead into streams, or for some other cause, the tombs of India — recognized as such — all seem to pertain to the Mussulman



Tombs in India.

epoch. Notwithstanding marked distinctive characteristics, they present strong likenesses to similar structures of other Moslem peoples.

Among these monuments we call attention to the royal tombs at Golconda, which are familiar to us in photographs and engravings, the tombs at Baroda, of the Queen at Ahmedabad, of Muhammad Ghaus at Gwalior, of Akbar at Secundra, of Humayun at Delhi, and of Altamsch at the Kutab. The mausoleum of the Emperor Taghlak at Taghlakabad is an extraordinary specimen, imposing in aspect, and resembling purely religious edifices much less than do the generality of these tombs.



Tombs of the Caliphs at Cairo.

The next cut gives a still better representative of those Indo-Mussulman tombs which consist of a cubical or prismatic basement supporting a sort of kiosk with a bulb-shaped dome borne on four or twelve columns, these being so placed as to form a square or an octagon. The group of royal tombs at Maha Satti, near Udaipur, is a fine example of this variety.

The other peoples of Eastern Asia scarcely offer specimens of funerary architecture worthy to figure in this short study.

ORIENTAL PEOPLES.

Sepulchral chapels, known as *turbés*, exist either as isolated structures or as adjuncts of mosques in all countries that have

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come under the sway of Islamism. Though often of modest dimensions, they are sometimes comparatively important edifices, as in the case of the Tombs of the Caliphs at Cairo. They are covered by a dome. They always exhibit the same general features, but with varying degrees of ornateness. Broad apertures closed by open-work gratings give the passer-by an opportunity to look into the richly-decorated interiors. The bodies rest in sarcophagi covered with sumptuous draperies; plants, carefully cultivated and trained, lend an air of cheerfulness to these buildings, and the wonderful light of the Orient clothes them with all its magic enchantment.

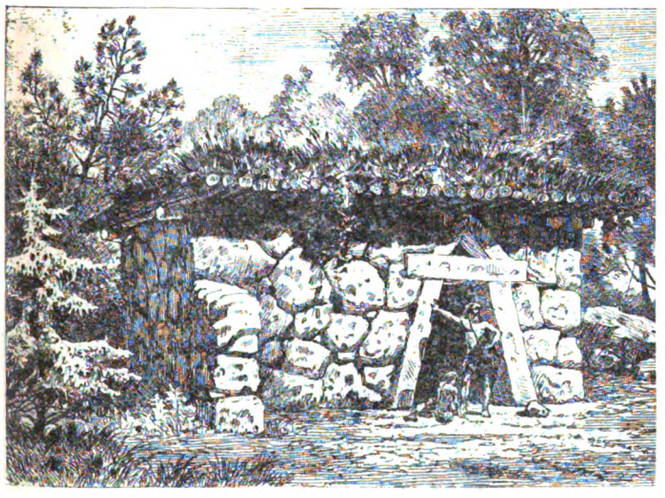
In viewing the Tombs of the Sultans at Constantinople, one is impressed by the tone of quiet serenity which pervades them, and he understands, better than by all his reading of philosophical treatises, the calm fatalism with which the Mussulmans face death. These monuments have, of course, undergone modifications according to their situations and the periods of erection, but the essential characteristics are still unchanged.

In Northern Africa, the tomb-chapels of the Marabouts resemble the *turbés*. The name *kuba* has been applied to them.

Naturally, this kind of burial was, and is still, reserved for persons distinguished by their rank or their presumed sanctity. Vast cemeteries receive the remains of common mortals. In these there are no important monuments. The graves are covered with simple slabs, at the head of which are erected stelæ of singular form, and terminating with an ornament which recalls more or less faithfully the head-wear of the deceased. The celebrated cemeteries of Constantinople have been so often described that we will merely add that, like the *turbés*, their countless tombs, enshrouded in verdure, call up no mournful associations.

[To be continued.]

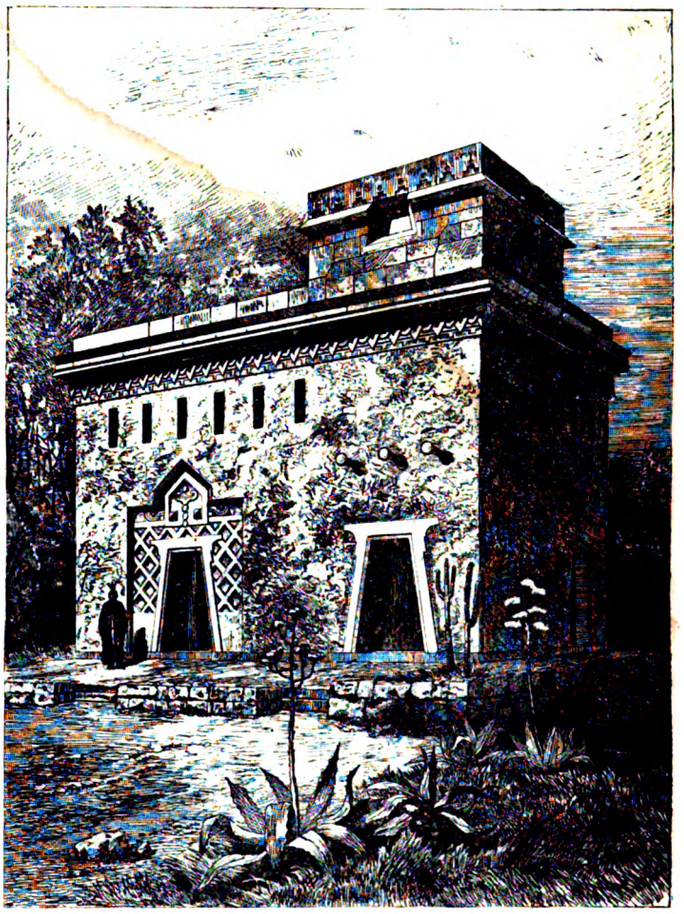
HISTORY OF HABITATION. — I.



Pelasgian Hut: from the *Moniteur des Architectes.*

CHARLES GARNIER is one of the greatest architects of modern times, and he does honor through his talent to the country which saw his birth. I consider him an artist of the highest merit, although I have not for the Opera-House at Paris, of which he is the creator, that unreserved admiration which some of his adorers profess; but I am willing to pay to his erudition and his intelligence the homage which is their due, so that there may not be attributed to a *parti pris* on the part of the critic the feelings and observations which I shall have occasion to formulate apropos of the History of Habitation, which has been one of the greatest attractions of the late Paris Exhibition. The idea was in itself a great one. What more interesting and more marvellous than to see collected within a definite area a fairly complete collection of specimens, which allow us to see, across the veil of years, the different developments which the human dwelling has undergone in its enlargement, its embellishment, its perfecting, while being transformed from a simple cavern or hut into a palace. The stages followed by man over this route mark in some sort the different phases of progress, and each amelioration introduced responds to a victory gained by civilization. From the cave to the hut, from the hut to the cottage, from the cottage to the farm-house, from that to the mansion, and from the mansion to the monumental palace there are as many transformations as the troglodyte passed through before becoming the polished and elegant being that we know to-day. The history of habitation is then in certain respects the history of civilization, and we can say to a man: "Tell me where you lodge, and I will tell you what you are." The habitation is so characteristic of the social state that the patient archæologist has been able to reconstruct the history of vanished and forgotten nations through merely interpreting the principal traits of their customs from the débris of walls again brought to light. The wall of the human dwelling is a book from which a philosopher and historian can read as clearly as from the page of a treatise. It is precisely this which rendered difficult the realization of the idea conceived by M. Garnier, towards which the Republic lent him the largest assistance. However large the area granted by the State might have been, however considerable might have been the appropriations set aside for the purpose, the result accomplished must inevitably have been beneath the undertaking, and this not only because there are considerable *lacunæ* in the knowledge which we have of this complicated question of habitation, but also because the things which we already know form a mass of ideas of such size as to make it impossible to include them within the always narrow limits of an exhibition.

This material difficulty once understood, and it could not have escaped the perception of the great French architect, he must perforce impose upon himself a synthetic plan, and limit himself to a



A Dwelling of the Incas: from the *Moniteur des Architectes.*

choice of types or groups forming, should I say, the culminating point of the *mise en scène* which he desired to create. As a fact, he divided his exhibition into three sections, the first of which included the prehistoric habitations; that is to say, those belonging to the time which elapsed from the appearance of man upon the earth up to the beginning of history. The second section embraced the dwellings of the races who, from the beginning of the historic period, have pursued an upward march and have striven for the moral and artistic elevation of their race. Finally, the third and last section was reserved to the peoples and tribes who have been willing to live apart, and who, while they have attained, like the Chinese, for instance, a certain degree of refinement, have never been willing to mingle in human intercourse with others; or who, like the negroes scattered in the depths of the African continent, have never emerged from barbarism.

In my opinion, this distribution was erroneous, and could result only in arbitrary classifications and groups. What in common, for instance, can there be between the cottage of the Kaffir and a Chinese pagoda? And the types of habitation belonging to backward races, would they not be better placed amongst the prehistoric collections, since they belong to peoples who have not yet any history, rather than by the side of the models from the Celestial Empire, which, in fine, represent a very advanced stage of perfection, although for a long time stationary?

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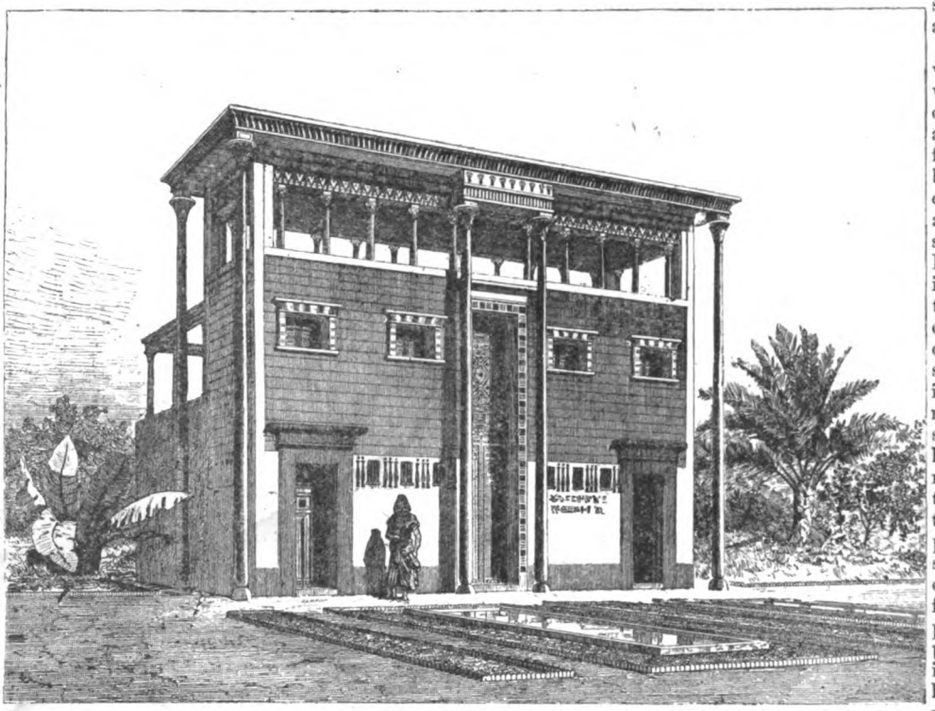
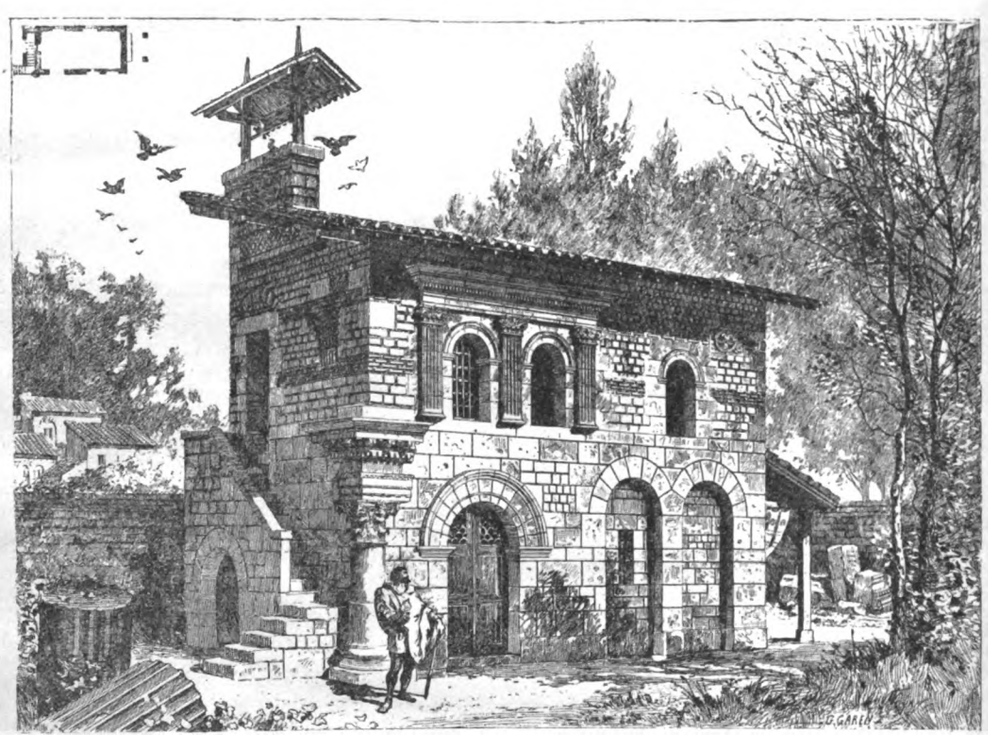
M. Garnier's fundamental error — almost unpardonable — consists in this, that he has been willing to give to his work an ethnographic signification, while the problem which he had to solve was a different one. I have said above that the history of the dwelling is the history of civilization; but, if one takes the trouble to go to the bottom of this definition, it will be found that the history of the dwelling is, first and above all, the history of architecture. It is certainly regrettable that it should be an architect who forgot this truth. If M. Garnier had wished to make known to us the origin of styles, the sources of the architectural beauties which represent in this branch of art scholastic principles clearly defined, he could have, without contracting his frame, without diminishing his idea, made a more logical work, more interesting, more practical and more scientifically true, than this which he has accomplished.



The Egyptian House, from the *Moniteur des Architectes.*

It is not that I am a great admirer of that which is called style in architecture, but, after all, there are certain data which are definitely fixed in our art, the autonomy of which no one denies, even those who contest its utility and beauty. It would have been more interesting to show how the hut of reindeer-skin became the Gothic dwelling-house; how the Arab tent was transformed, little by little, into a Moorish dwelling; how the hut of the first inhabitants of Peloponnesus could, in the passage of ages, become a rich palace, ornamented with Ionic, Doric or Corinthian colonnade; through what commingling the Byzantine house arose; to make us see the different phases through which the lake-dwellers' habitation passed before it finished in the creation of that marvel of the world which is called Venice, that type of city which had its cradle on the brink of the marshes where dwelt on piles the first men; while the Florentine palace of the Renaissance is only a derivative from the hovel covered with lime which sheltered the shepherds in the Golden Age.



Gallo-Roman House, from the *Moniteur des Architectes.*

Nevertheless, once given the ethnographic principle which M. Garnier selected as his guide, I am happy to bear witness that he has followed it with scrupulous fidelity, and that the work thus conceived lacks neither grandeur nor interest. He has allowed us to pass in review all the human races, to take a bird's-eye view of the customs of each people, to surprise, so to say, in the intimacy of their homes the tribes and nations which have furnished the types for his collection. I confess, for my part, that I have been very much interested by the collection of the habitations of the prehistoric age, which were subdivided into two categories — that of the natural shelters and that of artificial shelters.

The series begins with a camp formed with a trellis-work of peeled branches arranged about the foot of a tree, and belonging to a race of nomadic hunters armed with flint-stone weapons. Later, when the immense rivers of the early ages ebbed, they left uncovered, as they subsided, vast fissures in the rocks, where man, always in search of shelter, hastened to take refuge, and, behold, the cavern of the troglodyte explained. The first step on the way to civilization is made, for savage man, provided with a permanent dwelling, which defends him from the weather and the attacks of ferocious beasts, finds leisure and repose which he will utilize for the perfecting of his arms, and for substituting in their fabrication the polished stone for the unwrought stone. At the sight of one of these caves one experiences a very lively emotion, and, must it be said? a movement of compassion mingles with respect for these inhabitants of the land who were our own ancestors. The idea that one ever had as the head of his family a troglodyte may, perhaps, wound aristocratic prejudices; but I prefer, for my part, to descend from the cave-man rather than from the ape, and I can better console myself with having in my genealogical tree a nomadic hunter of the age of stone than to see perched there a chimpanzee.

Without doubt, the most attractive section was that consecrated to the white race, which is, after all, the only one which has seriously labored for civilization, and, consequently, for the progress of the arts. This race was subdivided according to Biblical traditions into three branches: that of Ham, represented especially by the Egyptians; that of Shem, to which belong the Syrians, the Phœnicians, the Israelites, the Pelasgians and perhaps, also, the Etruscans; and, finally, that of Japhet, from whom we Westerners, we who are most commonly designated under the name of Aryans, are descended.

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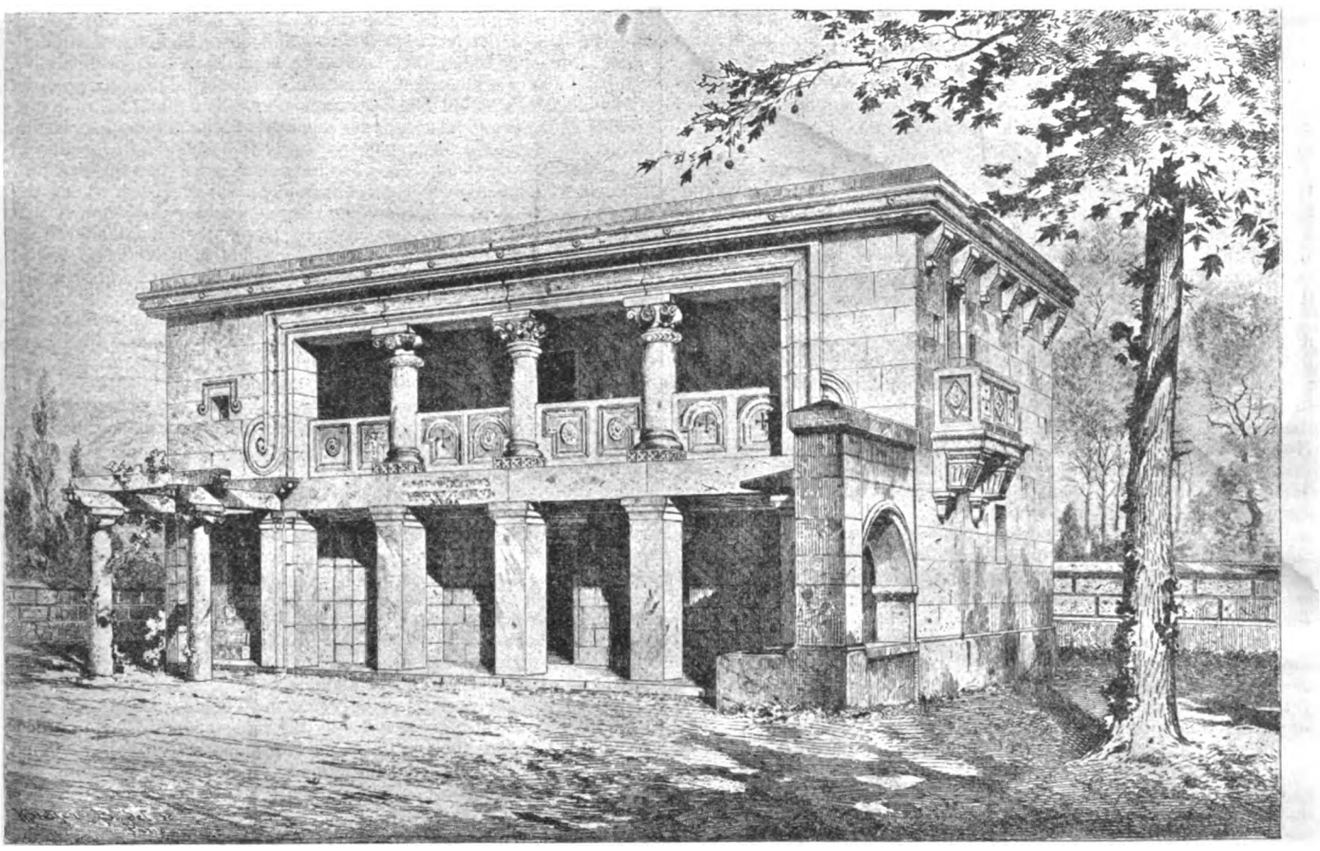
The Semitic race and the descendants of Ham halted abruptly on the road of progress, and for nearly two thousand years they have ceased to contribute to the cause of civilization. The descendants of Japhet are the ones who have pursued and still pursue the task abandoned by the other members of the white race.

Amongst the habitations which belong to the race of Shem, we could remark a splendid Assyrian house, with severe and sombre lines, built of massive stone, and forming a compact and heavy whole, while just beside it could be admired a Phœnician house, the rich carpentry work of which and the admirable work of the balconies, ornamented with blinds, showed that formerly these people knew how to join elegance with solidity. From the richness of these accessories and the variety of ornament, one judged that he was standing before the dwelling of a member of a race of rich merchants, who, in the course of their excursions, were able to lay-in abundant store of the cedars of Lebanon. A little distance away one saw a tent and a Hebrew house. The tent was of leather, and dated to the epoch when the Children of Israel were forced to live before the birth of Moses, a life of vagabondage on the banks of the Nile. The house, formed with a flat roof and a parapet, and enriched with beautiful decorations, was contemporaneous with the reign of David, whose reign marked the most splendid epoch in the career of the elected people. The dwellings of the Pelasgians and Etruscans were also there, and recalled to us that, before the dawning of the Roman Empire, and at the very time when Greece plumed itself on possessing a monopoly of the arts, there were already people who possessed a relatively refined conception of the beautiful.

At this point ceased the efforts of the children of Shem and of Ham, the former, as, for instance, the Pelasgians and the Phœnicians, disappeared mid the human currents with which their commercial instincts too directly mixed them. The others, like the Israelites and Etruscans, were crushed out by the Roman domination, and suffered atrophy through unceasing servitude.

H. MEREU.

[To be continued.]



Byzantine House: from the *Moniteur des Architectes.*

NEW YORK MONUMENTS. — The New York *Evening Post* for February 11, publishes the following statement showing the progress New York has made in its several attempts to erect monuments in that city. The Hospital subscriptions should go a long way toward silencing the sneers of outer barbarians in other parts of the country: To date (official subscription), World's Fair Guaranty Fund, $5,150,119.

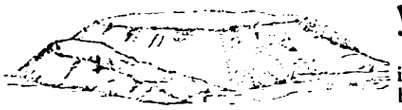
To date — since May, 1889, Washington Memorial Arch Fund, $70,257.41.

To date — since 1885, Grant Monument Fund, $141,248.

To date — since Christmas, Hospital collections $53 795.10.

THE BUREAU OF ETHNOLOGY'S FIFTH ANNUAL REPORT. — I.

ON BURIAL MOUNDS, BY PROF. CYRUS F. THOMAS.



THE Fifth Annual Report of the Bureau of Ethnology again illustrates the inexhaustible richness of the material existing within our national domain, both in the remains of ancient races and in the opportunities for research afforded by the living representatives of primitive cultures. These publications under the auspices of our national Government are of such value as to justify fully the establishment of the system; their character is thoroughly appreciated by European scientists, as the writer had occasion to observe at the International Congress of Americanists at Berlin last year, where eminent men took pains to speak to him with the warmest recognition of the work of Major Powell as Director of the Bureau, and grateful appreciation of the generosity of our Government in distributing its publications, so elaborately prepared, among foreign institutions and investigators. Such work, they said, was bearing worthy fruit in the importance to which the primitive races of America had been raised as offering the best existing field for ethnological studies.

The present volume ranks with its predecessors in the beauty of its illustrations and its letter-press. The subjects treated cover a wide range in space, time and race: the Mound-builders, the Cherokees, the Navajos, the Seminoles and the Zuñis. The last-mentioned, however, might better have been omitted; the treatment of the subject is so superficial as to make it unworthy a place in a publication that places the stamp of scientific authority upon its contents. With this exception the various essays are careful and able efforts, mostly the results of long and exhaustive studies in their respective fields. Major Powell's editorial comments on the papers in the volume are, as usual, instructive reading, often helping the reader to a more complete understanding of the former by showing the light in which they appear to a most earnest investigator.

Major Powell also gives an interesting review of the extensive work of the Bureau, both office and field, and he shows how, in the latter department, extensive and systematic work is important, since "the study of these subjects cannot be pursued from the accounts (however invaluable) of the early explorers and the precious vocabularies of pioneer missionaries, without the interpretations and corrections to be obtained among existing tribes by the latest scientific methods of research."

The first paper in the volume is an elaborate study of "The

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Burial Mounds of the Northern Sections of the United States," by Prof. Cyrus F. Thomas, who is at the head of the field-work of the Bureau east of the Rocky Mountains. He classifies the mound-regions of the United States into eight distinct sections, according to the nature of the remains brought to light during their investigation, the differences between these warranting the conclusion that the respective areas were occupied by different peoples or tribes. In general terms these areas are designated as: [1] the Wisconsin District; [2] the Illinois or Upper Mississippi District; [3] the Ohio District; [4] the New York District; [5] the Appalachian District, including the mountain region of North Carolina, Tennessee, Virginia and Kentucky; [6] the Middle Mississippi area or Tennessee District; [7] the Lower Mississippi District; [8] and the Gulf District, including the Gulf States east of the Mississippi. Professor Thomas's conclusions are concisely summed up as follows:

"First. That different sections were occupied by different mound-building tribes, which, though belonging to much the same stage in the scale of culture, differed in most instances in habits and customs to a sufficient extent to mark, by their modes of burial, construction of their mounds and their works of art, the boundaries of the respective areas occupied.

"Second. That each tribe adopted several different modes of burial, depending, in all probability, to some extent, upon the social condition, position and occupation of the deceased.

"Third. That the custom of removing the flesh before the final burial prevailed very extensively among the mound-builders of the northern sections, the bones of the common people being often gathered together and cast in promiscuous heaps, over which mounds were built.

"Fourth. That usually some kind of religious ceremony was performed at the burial, in which fire played a prominent part; but, notwithstanding the very common belief, there is no evidence whatever that human sacrifice was practised.

"Fifth. That there is nothing found in the mode of constructing these mounds, nor in the vestiges of art they contain, to indicate that their builders had reached a higher culture-status than that attained by some of the Indian tribes found occupying the country at the time of the first arrival of Europeans.

"Sixth. That the custom of erecting mounds over the dead continued to be practised in several localities in post-Columbian times.

"Seventh. That the character and condition of the ancient monuments and the relative uniformity in the culture-status of the different tribes, shown by the works and the remains of art found in them, indicate that the mound-building age could not have continued in this part of the continent longer than a thousand years, and hence that its commencement does not antedate the fifth or sixth century. Nothing has been found connected with the mounds to sustain or justify the opinion, so frequently advanced, of their great antiquity. The calculations based upon the supposed age of trees growing on some of them are fast giving way before recent investigations in regard to the growth of forests, as it has been ascertained that the rings of trees are not a sure indication of age.

"Eighth. That all the mounds which have been examined and carefully studied are to be attributed to the tribes found inhabiting this region and their ancestors."

Regarding the seventh of these propositions, Major Powell offers the suggestion that an attempt to fix the duration or beginning of the mound-building period is unadvisable in the absence of evidence not yet obtained and which may never be forthcoming, and it is also suggested that there is not yet sufficient evidence to justify any decided view as to the routes by which the several Indian tribes reached their historic seats.

There has, indeed, been too great a tendency to look upon the mounds as the work of an entirely different people from any of the races now inhabiting this continent, forming a mighty empire and standing on a greatly superior grade of culture. So far as investigations have led, however, this continent appears not to have been inhabited by any other branch of the human family than that known as "Indian."

In stating his position upon this point, Professor Thomas says concerning the former view: "So strong, in fact, is the hold which this theory [in the broad sense including also the Toltec and Aztec theories] has taken of the minds of both American and European archæologists, that it not only biases their conclusions, but also moulds and modifies their nomenclature, and is thrust into their speculations and even into their descriptions as though no longer a simple theory but a conceded fact. Hence it is necessary, before a fair and unbiased discussion of the data can be had, to call attention to the fact that there is another side to the question. Unless some protest is presented, or some expression of opinion is made on this point in my paper, the facts I give will be viewed through the medium of this 'lost race' theory. This I desire, if possible, to prevent, and whether the Indian theory proves to be correct or not, I wish to obtain for it at least a fair consideration. I believe the latter theory to be the correct one, as the facts so far ascertained appear to point in that direction, but I am not wedded to it; on the contrary, I am willing to follow the facts wherever they lead. Although additional data will hereafter be obtained, and many new and important facts be brought to light, yet, as I believe, sufficient evidence has been collected (though much of it remains unpublished) to indicate what will be the final result so far as this general question is concerned."

In the acceptance of this view, however, there is the same danger of being carried too far, and pursuing investigations upon the reformed lines to conclusions equally erroneous, as has proved the case with the unquestioning acceptance of the broad theory laid down by the late Mr. Morgan as the result of his invaluable studies. The outcome of the latter was, as we have seen, that Mr. Morgan's followers were inclined to test everything by the inflexible formula of "communal organization," unnecessarily depreciating everything characterizing the indigenous cultures of America as the outcome of "a low stage of development," reducing all institutions to a uniform pattern that brought the Algonquins and the Iroquois into the same category as the Aztecs, the Mayas and the Incas, thus giving unintended aid and comfort to the orthodox Classical archæologists in their scorn for the great field presented by the western world.

In fact, however, the romantic hue that has been cast over the mysterious past of the aboriginal races of America, ascribing to them empires and kingdoms, with monarchs and princes and all the pomp and splendor of a European state, has an almost exact parallel in the false glamour with which the conditions of the early Classic ages were surrounded, and which has not yet been removed. An examination of the cultures of the Homeric periods would show that their petty kingdoms with their warfares must be reduced, also, to their tribal districts with their feuds and all the institutions of a primitive "communal culture." Mr. Cushing, in reading the Homeric poems in the light of his Zuñi researches has found in the former the most astonishingly exact parallels with the conditions of a Pueblo culture. Neither must we forget that in the ceremonials and customs attending the life of the Aztecs, the Incas and other high-American cultures of the pre-Columbian days there must have been a formality, an exactness of etiquette, a splendor of paraphernalia and a pomp of observance comparable, in impressiveness, with the state of a mediæval European court; while for a parallel to the unpleasant circumstances which have been pointed to as indicating a low order of development — we would not have to go back more than three or four centuries in the history of even our ancestral England, where the environment of even the higher classes would exhibit much that would be unspeakably repugnant to us of to-day. The veil of romance that has been draped over the antiquity of both Old World and New is a result of the same tendency to glorify the past which appears common to mankind everywhere, and which leads the savage to elevate his ancestors to the rank of gods. With us the romantic view persists in the case of a Classical antiquity, because we have been accustomed to behold it through the medium of the grandest poetry, and because it developed into an era of the noblest art as well as of intellectual achievement.

Therefore, because of what the latter led to, we have been disposed to regard it as essentially different from what it was in reality.

So, while, undoubtedly, this entire continent was occupied by the great branch of the human family known as "Indian," exhibiting very likely everywhere certain culture-traits common to all, just as corresponding traits will be found in common throughout all the Aryan nationalities, yet there will be found among the various Indian peoples of America characteristics just as distinct as among the Aryans or the various Asiatic peoples — for instance, the English as contrasted with the Spanish, the Scandinavian with the Italian, or the French with the Bulgarian, and in Asia, the Japanese with some wandering tribes of the Siberian steppes.

We see by the researches of Professor Thomas that there must have been marked differences among the various mound-building peoples, and therefore there were in all likelihood strongly distinct nationalities and probably varying grades of culture. The extent and magnitude of their remains indicate that they must have been a very numerous and powerful people at one time, carrying on a commerce more or less considerable between the various sections of the country, as shown by articles found in the mounds brought from regions often many hundred miles apart. With their number and extent it is probable that their social structure was more highly organized than among the Indians occupying the country at the time the Europeans came. The fact that one of the great regions where the remains of the mound-builders are the largest and most extensive — ranging from the great lakes southward beyond the Ohio into Kentucky and Tennessee — was almost uninhabited at the time of European occupation, though finely endowed by nature to meet the wants of man, seems to tell that the people who built the mounds must have been either exterminated, or driven to other parts of the continent, by invaders who, as is apt to be the case, were of a lower degree of culture.

Therefore, while subsequent populations in a region may be of the same general race as their predecessors, it by no means follows that they are the descendants, even though they may to some extent have customs and traits in common with the older occupants of the soil. There are reasons for doubting the theory of the degeneracy of a people whose national integrity has been maintained — a degeneracy manifest in inferior accomplishments and culture. Such attainments would not easily be lost except through radically changed environment and national disintegration. Common traits may be heritages from the period before the differentiation of the racial stock, and this would account for the similarities together with the inferior culture of a subsequent wave of population from the parent-source overwhelming a more advanced and kindred people, just as the Apaches may have overwhelmed the town-dwelling populations of the

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Southwest, bringing with them many things from common ancestors, and acquiring other fragments of the superior culture during the long periods they lived in the neighborhood of their more civilized brothers, through contact and the absorption of captives and renegades, or of remnants of exterminated populations. In this way it was that the Pimas, in the Southwest, probably acquired traits of the ancient town-dwelling populations whose country they now occupy, the possession of which naturally led some investigators to infer that they were degenerate descendants of their predecessors. Had they been descendants, however, they would not be likely to show such a deterioration. Even the New England Pilgrims acquired certain things by contact with the aborigines, such as the use of beans, pumpkins and Indian-corn, the making of "succotash" and "nocake," and the great festal institution of "clam-bakes." Yet they could hardly be called descendants.

Attentive observers may see this process of acquisition of institutions from another people still in operation among the Indians. To "steal the magic" of another nation is considered a great achievement. Mr. Cushing took two of the Zuñis to the scene of his excavations in the Salado and Gila valleys in Arizona, and they were wont to lurk around the meeting-places of the Pima medicine-men, listening unperceived to their songs and memorizing them to carry back to Zuñi in triumph. In this way similarities of ritual, etc., among unrelated tribes, may to a considerable extent, probably, be accounted for.

Professor Thomas gives an interesting explanation of the building up of a large mound over the body of a man of high rank as illustrated in a mound excavated at Naples, Ill., where a large shell was found on the earth just over the head of the skeleton, with a number of bone awls sticking in the sand around. Much light is thrown on this by the reproduction of a quaint plate from Part II of De Bry's "*Brevis Narratio*," with a very Renaissance-looking circle of savages conducting a ceremonial around a very small mound surmounted by a large shell and surrounded by arrows stuck in the ground. A similar ceremonial was undoubtedly performed at the great Naples mound at the stage when the shell was placed above the body.

Many of the articles from the mounds built by the people of the highest culture show such a resemblance to the work of the Mexican and Central American peoples that it could not be accidental; there must have been some close connection, probably of race and certainly of culture. A comparison of Figures 42, 43 and 46, depicting engraved copper and shell articles taken by Mr. Rogan, one of the

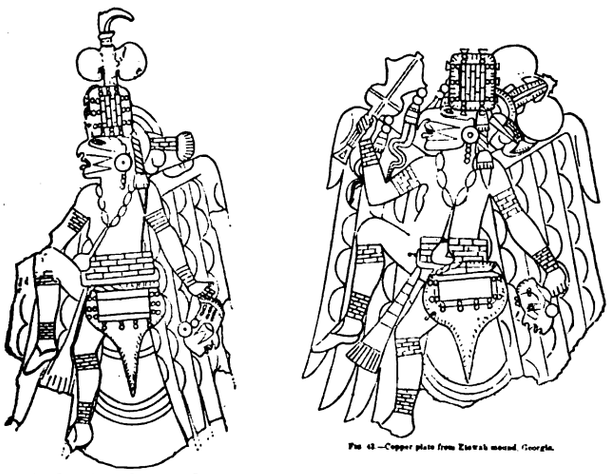

Fig. 43.—Copper plate from Etowah mound, Georgia.

Bureau assistants, from a large burial-mound at Etowah, Ga., with similar work from Mexico and Central America, is sufficient to show this. Professor Thomas finds in this work "a combination of Central American and Mexican designs: the graceful limbs and the ornaments of the arms, legs, waist and top of the head are Central American, and the rest, with the exception, possibly, of what is carried in the right hand, are Mexican." There is, however, a radical difference in the connection of this people with the Mexican and Central American cultures and that established by Mr. Cushing as existing between the ancient populations of the southwest of this country and the same; while the "Aridian," or "Shiwian" culture, as he has called it, is the parent of those to the south, that of these mound-builders is evidently subsequent to that of the Aztecs and Mayas, and derivative from them; a fact that Mr. Cushing has observed in his studies of the lines of culture-influences in the New World. Professor Thomas's paper has a highly important supplemental note in the shape of a straightforward and detailed account of the burial ceremonies of the Hurons, translated by Miss Nora Thomas from the "*Relations des Jesuites*," written by Jean de Brebeuf in 1636.

It is to be hoped that the researches of the Bureau of Ethnology in the great territory covered by the remains of the mound-builders may be prosecuted without a recurrence of the interference that took place last season in the district outlined in Ohio by Professor Putnam for the Peabody Museum at Cambridge. The field is so vast that there appears no good excuse for interference in the region selected by Professor Putnam for the careful and exhaustive investigations already so fruitful in results. There are but few archæological undertakings in the field in this country, and it would be well if there could be some agreement entered into by which the territory and the activities of each could be defined and understood mutually, with conferences from year to year for the interchange of views and information as to results. There is no scientific excuse for rivalry in this work. The archæology of primitive races has almost just begun to assume the form of a real science. There is ample opportunity for high honors to all earnest workers. There is, also, a great advantage in separate investigations under distinct auspices, and the establishment of separate collections in various parts of the country, or even in proximity. We thus have explorations conducted by different methods, and things found from different points-of-view, while in the separate collections we have the opportunity for a wider acquaintance with the facts they illustrate as well as their exhibition under the aspects of different systems of arrangement and classification. All this could not fail to increase the illumination of the subject, just as our acquaintance with a statue is so much more complete if we behold it in the centre of a room with the light cast upon it from all sides instead of placed in a corner with the light all coming from one direction, leaving the other parts in obscurity. Preëminently, in this work what is done by each is for the good of all.

SYLVESTER BAXTER.

[To be continued.]

STRASBOURG CATHEDRAL. — STRASBOURG UNIVERSITY BUILDINGS. — THE NEW IMPERIAL PALACE. — SGRAFFITO WORK AND THE METHOD OF ITS APPLICATION TO THE POLYTECHNIQUE AT ZURICH. — PECULIARITIES OF CONSTRUCTION IN GERMANY. — A FIFTEENTH CENTURY WORKING-DAY.

IT has been held that the greater height and slenderness of the Ionic column, with its more delicate detail as compared with the Greek Doric order may be ascribed to the fact that the Ionians themselves could boast of a greater stature than the originators of the latter order; and that, furthermore, a comparison made between the outlines of their bodies would result much as the one so often made between the delicate Ionic and its predecessor, the refined and sturdy Doric order. If the one who views the façade of the cathedral at Strasbourg for the first time accepts this statement as a rule and applies it here, he will, of needs, laugh aloud; for he will see as builders of this wonderful cathedral the most wire-drawn and elongated specimens of the human race imaginable. The most corpulent of the people these builders must have seen about them would certainly have carried off the palm in a contest with some of our leading and most popular "ossified men." However, be that as it may, one is impressed at the first glance with the thinness and attenuated character of the front of this cathedral. One can hardly believe that the screen which covers the windows of the west façade is of stone, for the piers or rather the bars of this tracery are so painfully thin. I could not refrain from tapping these abnormally long supports to see if they were really of stone and not of iron.

The climb up the tower by the spiral staircase, which is entirely open, is most delightful, for at each step the view changes. The city with its several rivers, canals and fortifications and the Vosges Mountains in the distance makes a most beautiful picture. While in the foreground on one side is the Frauenhaus, the only remaining specimen of very early Renaissance in the city, on the other is an old half-timbered house, quite attractive with its quaint roof and carving. It is the oldest one in the city, and it was in it that Gutenberg experimented with his printing-press.

The foreigner, let him be from whatever land you choose, if he will betake himself to the cathedral when the stiff-limbed apostles take their noon-day journey from one side of the clock to the other and the cock professes to crow, will be sure to find one of his countrymen lost in admiration of this "wonderful astronomical clock," not perhaps because he sees any reasons for such emotions, but because he believes it due to the past generations who have stood in this self-same spot with similar feelings.

At twilight the effect of the interior is most wondrous. The last rays of the setting-sun, softened and faintly colored by the stained-glass of the windows, but dimly light the interior; while the windows themselves remain brilliantly illuminated.

Opposite the south front of the cathedral is the Frauenhaus, which contains a collection of the original plans and old drawings of the cathedral together with plaster-casts, models, etc. Also the bits of carving, statuary and such like which were broken off during the bombardment in 1871. A most beautiful spiral staircase is to be found in this building, partly late Gothic and partly Renaissance. I wanted much to get a sketch of it, but sketching is strictly forbidden; so many poor sketches have been exhibited, all of which

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claimed to be this staircase that, in a moment of compassion for the unknown architect, the authorities have decided to prohibit henceforth all sketching in the building.

Of modern examples of architecture there are, besides the depot and the new palace, the buildings of the Strasbourg University. The main building of this group is perhaps of the most interest. It was the outcome of a competition in which some of the best-known architectural talent of Germany participated, and which resulted in the adoption of the design submitted by Professor Worth, of Karlsruhe. [See Illustrations.]

The approach is through a park with beautifully kept lawns enlivened with flower-beds and shrubbery. Then, after ascending the broad flight of steps, one enters through one of the five double-doors, carved and enriched with wrought ironwork, and finds himself in the entrance-hall — a space of some 30 x 55 feet, frescoed and vaulted, the vaulting being supported on three rows of columns whose bases are of sandstone, shafts of gray granite and caps of bronze. To the right (58) is the porter's room, to the left are toilet-rooms and a lounging-room for the use of the professors. A few steps higher, on one hand, lies the corridor which leads to the various lecture-rooms and seminaries. On the corridor in the other direction open the rooms of the faculty; 15, 16 and 17 are those of the secretary; 12 and 13 are small committee-rooms; while Nos. 10 and 11 are placed at the disposal of the treasurer. The room indicated as No. 32 is the general reading-room, containing, however, only the daily papers and periodicals, the University library being in a separate building. One now enters the court, perhaps the most imposing feature of the whole building, a space 75 x 95 feet, lying three steps lower than the adjacent halls and corridors, surrounded on all sides by arcades and covered by a huge skylight of colored glass. The arcades are of stone, not of concrete, a material so generally employed in Germany that whole fronts are covered with pilasters, consoles, corbels and decorative panels cast in this material and painted to imitate stone.

Broad staircases of stone, with treads curiously tooled in very low-relief to imitate a mosaic pattern, lead on either side of the stair-hall (2, 3, 4) to the floor above. On this floor, rooms 35 to 42 are given up to a collection of plaster-casts. The remaining rooms are class-rooms with one exception, the Aula, where such meetings as are usual between the faculty and the student-body are held. This is a hall most elaborately decorated in white-and-gold in the style of the modern Renaissance, with richly carved caps, wainscoting and an ornamental plaster ceiling.

An examination of the first-floor plan shows, roughly estimated, a floor-area, under roof, of 58,500 square feet. Including the court (which is virtually nothing but a thoroughfare, but also having use as a light shaft) a total of 25,700 feet is given up to hall-space, stairways, vestibules, etc., or approximately 44 per cent of the total floor-area. If, however, we exclude the court which could, without injury to the plan, be left without a covering, there still remains an area of 18,575 square feet used for hall-space, or 32 per cent. We may draw our own conclusion from these figures. Magnificent vestibules, halls and courts are undoubtedly very nice, but they "come high."

The building, I am told, is most excellently heated throughout by hot-air. Two gas-engines, of from nine to ten horse-power each, are used to force the cold air through ducts placed under the cellar-floor to the five heaters, which are placed at appropriate points in the cellar. The cold air after having been heated by contact with the steam-coils enters a large hot-air duct, which runs along under the first-floor joists, and from it is distributed by smaller pipes to the rooms above. A second duct into which cold air is forced and which can be placed in connection with the hot-air duct just spoken of, so that the air in it may be partially heated, is also provided. Likewise through smaller pipes this partially heated air can be brought into the rooms, and thus their temperatures can be regulated to a nicety without at any time either stopping the influx of the heated air, or passing cold air into the room. No artificial ventilation is used, the air simply escaping through registers near the ceiling. A most ingenious use is made of this apparatus during the hot months of the year. The gas-engines are again put in motion and the air which has been cooled in the following manner is forced through the pipes:

The cold-air duct opens into a cement basin extending some six feet below the surface and covered by a cage eight feet high, the sides of which are of netting while the top is covered with sod and plants. In this structure is placed a series of screens covered with a porous, absorbent cloth upon which water is constantly allowed to drip from a net-work of pipes above. The current of air which is forcibly drawn through these cloths is rapidly cooled by contact and distributed throughout the building. By this method the temperature in a room can be lowered from ninety to seventy degrees Fahrenheit.

Leaving the University again by the main entrance one sees directly ahead the new Imperial Palace, a typical example of one division of the modern German Renaissance. It is built of buff sandstone, the first story rusticated, the second decorated with shields and panels and pilasters, and all sorts of the choice bits of decorative work invented for the use of the architect who has more money at his command than he can conveniently use.

The staircase hall which is entirely of stone and marble is very pleasing. One flight leads to the first landing, where the stairs divide in two parts to reach the floor above. On each side of the first run is a cascade; the water spouts from lions' heads at the top, only to reach the pink marble basin below after having passed over a series of steps of the same beautiful material.

The chandeliers, all of wrought-iron, fire-gilt, show wonderful skill in the use of that material.

In Munich the frequency of frescoed façades attracts the attention of the traveller who has just left behind him the monotonous blocks of Paris. This art probably owes its popularity to the great use which is made of concrete, a material which owes its existence largely to the lack of proper building-stone in the vicinity, and a disinclination to use brick and terra-cotta. Of brickwork one sees very little, it being seldom exposed, even in the rear walls of buildings, as it has been found cheaper and better to cover the brick with a thin layer of mortar than to point and finish it so as to make it presentable. Besides the stereo-chromic fronts which, by the way, have since the introduction of water-glass, almost entirely replaced the old manner of frescoing (*i. e.*, of putting on the color while the plaster is still soft so that it may enter into combination with the lime to form a durable and peculiarly pleasing crystalline surface), there is the so-called sgraffito method of decorating plastered exterior wall-surfaces. It is not now very extensively used and seems to have outlived its popularity. This popularity, which it held for many years until the inborn love of color again cropped out and entered into all the decorative arts, as well as its durability and beauty may warrant me in devoting a few lines to its history and application.

Sgraffito is essentially the method of producing a design in monochrome on plaster by partly scratching away an upper covering layer in such a manner as to expose an underlying surface of a different color.

In following this art it may be of interest to note that the Greeks and Etruscans, to whom we may ascribe its origin, applied this decoration to their vases and pottery in general. Whether at this period it was also used in house-decoration is not known: in buildings of the Middle Ages, however, a few traces of it have been discovered. But we may say its first appearance was in Italy, during the fifteenth century; soon afterward, gaining ground, it made its way northward to the cities of southern Germany,— Augsburg, Munich, Ulm, etc., and also to Prague. In France it seems never to have taken any hold.

The success of sgraffito not only depends upon the drawing and the design but also quite as much upon the proper preparation of the surface to be worked. The essential qualities of this coating are, that it must dry slowly, in order that the artist may have ample time for completing his work, and secondly, the separate layers must, in drying, unite to form a solid, homogeneous mass which will neither crack nor peel.

On the building of the Polytechnique, at Zurich, the following method of procedure was very successfully used.

The first coating is the ordinary rough-cast, to each ten parts of which one part of cinders were added, to give the succeeding layers a better hold. This coat was perfectly dry before putting on the second coating, consisting of the following mixture:

Five parts of slaked lime.
Six parts of clean, sharp, brown sand.
Two parts of cinders (crushed to pieces of about the size of bird-shot). This was then put on in a layer sufficiently thick to cover all the projecting and uneven points of the previously applied layer. While this was still wet, a third coating of the same thickness as the latter was applied. This consisted of:

Three and one-fourth parts slaked lime.
Four parts of cinders (very finely crushed).
Two parts of sand.
One part of pulverized charcoal.
One-eighth part of lamp-black.

The finishing coat, which is of the same composition as the one just described, with the exception that one part in place of two parts of sand is used, was then applied.

Prepared in this way, these several layers dry to a mass as hard as glass, which never cracks nor peels; it is even more durable than cement-mortar. The final top coating consists of a wash of milk-of-lime, to which either yellow ochre or asphalt has been added to remove the glaring whiteness.

It may be observed here that the cinders are not only added because of their quality as a coloring matter, but also to give hardness to the composition, the lime seeming to have some chemical effect upon the silicates in the vitrified coal. On the other hand, the charcoal as well as the lamp-black are purely and simply coloring substances.

Immediately after the lime has been put on (three coats are usually given with a brush), the design is transferred to the surface to be decorated. This is either accomplished in the manner customary in fresco-painting (with stencil and a bag of charcoal-dust), or, better, by slightly indenting it upon the surface by tracing the design, which has previously been prepared full-size, with a blunt instrument. The artist now, with the tools which are at his disposal, rapidly outlines and shades the picture, which now appears dark on a white surface. To be successful, the work must not appear labored or overworked, but be bold and dashy; this depends to a great extent upon the design, which must lend itself to such treatment.

Often the opposite method is employed, resulting in a design upon a black background. Naturally, the design must be more heavily drawn than in the first case, in which the light surface tends to make the lines appear even heavier than they really are.

A third method is that in which the design is drawn in outline and then cross-hatched.

It is not well to attempt the imitation of carving in relief, rustic

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stonework, etc., in sgraffito: greater success is obtained by allowing it to hold its individuality simply as a surface decoration.

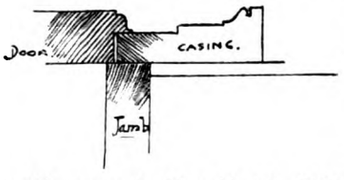
A few remarks upon the tools used in this art may not be out of place. Steel points having various degrees of bluntness, six inches long and about as thick as a carpenter's lead-pencil, one with a spoon at one end, and shaped like a spatula at the other, and a few small scoops constitute the equipment. An instrument for drawing parallel lines and one for describing concentric circles are very convenient at times. If any mistakes in drawing occur, the wrongly-exposed parts may again be whitened without detriment to the work, provided the under surface has not already hardened.

In Southern Switzerland, farm-houses are sometimes seen decorated with primitive but often effective sgraffito-work, produced by covering the wall-surface, which is of a dark-brown tint, with lime, and proceeding as above.

At the Polytechnique at Zurich, five thousand cubic feet of this ornamentation were applied, involving an expenditure of eight thousand francs, six thousand of which the artists received. The friezes on the north and south wings of the Polytechnique at Munich are also quoted as good examples of sgraffito-work.[1]

I entered on several occasions houses in the process of erection, and was surprised to note how much the usages of common house-construction in Germany differed from those in America. An ordinary floor, instead of being built of "2″ x 12,″ 16″ centres," is built of 6 x 6 inch beams placed about two and one-half feet from centres. A cleat is then nailed along the sides, near the bottom, of each beam, extending its whole length; the spaces between the beams are then floored and filled with sand, or some other deadening material, to the top of the joists, upon which the rough and then the conventional hard-wood floor is fixed. Matched flooring-boards are but seldom used; in the kitchen and halls, where the pine floor is to be left exposed, the boards, which are about ten inches wide, are simply laid with close joints and nailed at the intervals determined by the beams. The great width of the boards and the distance between the points of nailing, together with vigorous scrubbing and baths they are subjected to, tend to make an uneven and warped floor rather the rule than the exception in Germany. Very often a base is not used, a simple quarter-inch round or ogee moulding sufficing to cover the joint between wall and floor. Such luxuries as casings around windows, aprons under the sills, etc., are often done away with. On the other hand, a most unnecessary amount of material is heaped about the door-openings; almost always there is a heavy casing, architrave, frieze and a shelf supported by brackets, carved or plain. Brackets of plaster, to imitate carving, and then painted like the rest of the finish, I have often seen.

Their manner of building partition-walls appears to me worthy of notice; the result not only being a fireproof one, but also one of strength as well as cheapness. It is but an application of the ordinary half-timbered wall. A framework with braces of timber of the same width as a brick is erected, the spaces in between are then filled with brickwork, to which the plastering is directly applied resulting also in the saving of laths. The term plastering-reeds would be more proper, for, reeds about six feet long fastened together by wire are used instead of laths. These reeds already so prepared are taken to the building in rolls. All that is then necessary is to unravel the roll, and fasten the screen with staples or hooks to the ceiling. In a remarkably short time a room may thus be lathed.



Door-jambs are not rebated like ours, but are kept plain; the door, however, is the rebated member and is finished with a moulding. The sketch shows how the casing is put upon the door-frame. It will be seen that in this way a double rabbet is obtained without any extra work.

THE "WORKING-DAY" IN THE FIFTEENTH CENTURY.

Extracts from the contract between Jacob Russ, the carver of the Rathaus at Aberlinger and the city authorities: (Translated from a manuscript.)

"*Item:* — During the summer months, I, Jacob Russ, master-carver agree to begin the day's work at four o'clock A. M., and to continue working until seven o'clock P. M., with an allowance for meals as shall be hereafter stipulated. During the winter months the hours shall be from five until seven o'clock with an allowance for meals as shall be hereafter stipulated."

"*Item:* — I am to be allowed: For breakfast, one-half hour; for dinner, one hour; for lunch, one-half hour; for supper, one hour. Further, during the winter, I agree to dispense with the supper-hour as heretofore stated and to take lunch at the time customary for those in the city's employ."

"*Item:* — For food, my employers are to give me the sum of 15 kreutzers (about 7½ cents) a day and each of my men ten (about 5 cents) kreutzers."[2]

(To be continued.)

[1] I am indebted for much of this information to a Munich decorator, who has successfully used the method, which appeared in an article by Gottfried Semper in the *Zeitschrift für die Bildende Kunst* of 1868. Gottfried Semper, the famous author of "*Der Stil*," etc., professor and architect, is also the architect of the Polytechnique at Zurich, already spoken of, and where this method was revived after it had lain dormant for centuries. — T. F. L.

[2] Lest it be thought that the workmen of the fifteenth century, kept body and soul together with one cheese-sandwich a day or some other delicacy as can in these days be procured for five cents, I quote the following statistics, which I take from my note-book: "A dinner with a whole chicken and a quart of wine together with stabling and food for a horse, could be got for seven cents. A garment and head-dress such as peasant woman wore at that time cost seventy-five cents." Albrecht Dürer was offered by the city of Antwerp a yearly salary of $225, which was more than he earned at Nüremburg. This was in the first part of the sixteenth century. T. F. L.

THE DISTRIBUTION OF HYDRAULIC POWER IN LONDON.

FEW Londoners (writes a correspondent of the *Times*) are aware that there are now under the streets of the metropolis forty miles of pipes charged with a pressure of 750 pounds per square inch. These are the mains of the London Hydraulic Power Company, which now extend in a perfect network throughout the City, and from the docks at one end of London to Victoria at the other. Compressed air has been largely used for transmitting power in this country, notably in Birmingham, on the Continent, and in the United States; and electricians are working hard with a view to the introduction of electricity as the agent. But in London the system of hydraulic power is virtually having its own way.

It is now more than half a century since Lord Armstrong first directed his attention to the utilization of water-pressure and its transmission for mechanical purposes. For the past thirty or forty years hydraulic machinery has been in use at docks, at railway goods-stations, in warehouses, and elsewhere. But Lord Armstrong's enthusiasm led him to anticipate the time when the practice would be widely extended, when hydraulic power would be drawn from a common centre, especially for fluctuating and intermittent purposes. That dream has been realized. By the system which was established at Hull in 1876, under the direction of Mr. E. B. Ellington, by the system which has been organized in London by the same engineer, and by a similar undertaking at Liverpool, a service of high-pressure hydraulic power is now at the command of the public, of consumers large and small, the cost of the power being in direct proportion to the work done.

The mains in London are of cast-iron, varying in internal diameter from seven inches to two inches, and are kept charged constantly at a pressure of 750 pounds per square inch by powerful engines located at Blackfriars and Westminster. The engines at the Blackfriars station can pump 3,000,000 gallons per week, and those at Westminster 2,000,000 gallons; and the rapidly-increasing demand for power has necessitated the construction of a pumping-station at Wapping which will deliver 4,000,000 gallons per week. The present supply to consumers amounts to about 3,750,000 gallons weekly. This is consumed by somewhat over a thousand machines, and there are at the present time 200 applicants for machines to be connected with the mains. This power is supplied direct to lifts, presses, and other purposes of a similar character without the use of any engine or power-producing machinery, and can also be used for driving engines of special construction in the same way as steam or gas. Many such engines are now at work grinding coffee, ventilating, working elevators and crushers, driving dynamos and general machinery; but hydraulic power is chiefly used for machinery which is used intermittently. For pumping it is also valuable. No engine is required, only small direct-acting rams, which may be allowed to run without attention. The quantity of power used is measured in gallons by meters, and is charged for on a sliding scale, commencing with a minimum of 1*l.* 10*s.* per quarter for 3,000 gallons or under, down to about 2*s.* per 1,000 gallons in the case of large consumers. The power is available day and night and on Sundays, all the year round. There it is, to be had by the simple turning of a tap. There is no getting up of steam, no filling of tanks for one's own hydraulic supply. As has been indicated, it is where power is required intermittently that it is cheaper to use hydraulic power than to set up one's own gas or steam engine. The engineer of the Company considers that, taking all the circumstances into account, it can hardly be a profitable operation to supply public power under conditions similar to those which exist in London at less than 2*d.* per indicated horse-power per hour. This would be from 20*l.* to 25*l.* per horse-power per annum, working from fifty to sixty hours per week. Where the power used is small, that would compare favorably with the cost of steam. The comparison may not, perhaps, be so favorable with a gas-engine working under the most advantageous conditions; but directly the gas-engine is set to do intermittent work the advantage is largely on the side of hydraulic power, while for such purposes as lifting and pressing, the general convenience and simplicity of the hydraulic system are such that its use would, perhaps, scarcely be affected even if there were no direct economy in the cost of working.

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Failures of the mains occur occasionally, and, considering the very high pressure with which they are charged, this is a serious matter. The velocity of water at 700 pounds pressure through a free orifice being 320 feet per second, a hole only a quarter of an inch in diameter will pass between 30,000 and 40,000 gallons in 24 hours. The method employed for detecting leakage is based upon an automatic record of the quantity of water forced into the mains. When there is an abnormal increase during any night, particularly during the early hours of the morning, the mains are tested. Pressure-gauges of considerable range are connected to each of the mains radiating from a station. Each main is shut off in succession, and the behavior of the hands of the gauge will indicate whether there is leakage or not. By closing in succession the valves along a main in which a leak has been discovered, and by using a sounding-rod, nearly the exact spot of the leakage may be determined. On one occasion, from the record of the pumping, a leak was supposed to exist in one of the mains running from the Blackfriars station. An observation was made, and the action of the gauge could only be accounted for by a stop-valve about two miles away, supposed to be closed, passing a small quantity of water, and by a machine near the valve having been left working by an attendant. Upon examination at the spot the valve was found leaking, as had been expected, and the machine could be distinctly heard at work. It was a small hydraulic pump, and each stroke was indicated by the gauge.

One important use of this high-pressure water-circulation has not been indicated; namely, its use in case of fire. A small jet of high-pressure water injected into a larger jet from the ordinary water-works mains so intensifies the pressure of the latter in the delivery hose that a jet of great power can be obtained at the top of a high building without the aid of a fire-engine. Captain Shaw has expressed a very decided opinion as to the value of this high-pressure supply of water for the extinction of fire, but though the provision of the necessary injector-hydrant is comparatively inexpensive, the authorities have displayed an apathy on the subject which is difficult to understand. Last year Captain Shaw witnessed a most satisfactory experiment. The jet from an ordinary water-main, having a pressure of about 40 pounds per square inch, rose through a hose to a height of 40 feet or 50 feet. The high-pressure water was then turned on through a three-eighth-inch opening. The jet at once rose to a height of 90 feet or 100 feet, which, in the opinion of Captain Shaw, would have been as useful as any fire-engine for extinguishing a fire. It has been stated that in Manchester, after the introduction of high-pressure hydrants, the loss from fire was reduced by six-sevenths. In Liverpool the loss was reduced to one-fourth of what it was previously. If the annual loss from fire in London amounts, as is calculated, to over 2,000,000*l.*, and if the saving effected by an efficient system of hydrants were only one-fourth or even one-tenth of the saving effected in the cities mentioned, it would amount to hundreds of thousands of pounds annually.

THE SEWAGE OF RIO DE JANEIRO.

FROM a letter written from the capital of Brazil to the *Sanitary Record*, we extract the following regarding the disposal of sewage in that city:

"The Rio Improvements Company is responsible for the proper disposition of the entire sewage of the city.

"This company, an English one, received their charter, or concession, from the Brazilian Government so far back as the year 1857, but it was 1862 before their various works were built and they commenced operations. Their principal function is to control and utilize the entire sewage of the city, subject only to the supervision of Government inspectors, and they are under heavy penalties should they neglect their duties or cause an avoidable nuisance. For this work they are paid an annual subsidy by the Government and to every new house that is built they have to make the drains to the main sewer. They also either supply the sanitary fittings to the house or see that those placed in it are of suitable character, and not likely to cause offence or danger to the inmates. The company have six pumping-stations in different parts of the city, all abutting upon the bay, with wharves, on which are unloaded all their appliances and materials.

"The mode of treatment of the sewage is as follows: The sewage from a certain district is brought in a main to its station; here, as it enters the company's premises, it is treated with a mixture of lime, sulphate of alumina, and charcoal; it then passes on to precipitating-tanks of the usual character, and, after precipitation has been effected, and the effluent been allowed to travel through a series of narrow canals, it is discharged into the bay, inodorous and of a standard of purity which I was informed by Mr. Benest, the courteous managing director of the company, was much higher than required by the Rivers Pollution Committee in England. Without going into further details, I can safely say that, from whatever point-of-view it may be criticised, the mode of treatment of the Rio sewage is as good if not better, than the most approved arrangements we have.

"The residuum is dried and burned twice. The first burning gives back a lime, which the company either use for their own purposes or sell, if they have an excess. The second burning reduces it to a hard clinker; this is ground, and, I am assured by the managing director, makes as good a cement as the best Portland they can purchase. In Brazil manure is not required, but as nearly every house is faced with cement, there is an enormous demand for the article; hence, by utilizing the sewage in this manner, the company obtain a valuable marketable commodity. I must say, I was much astonished at finding in this much-abused place so perfect a system of sewage-disposal, so admirably carried out without nuisance to the inhabitants. I was, however, surprised to hear how little some of the leading inhabitants knew of the manner in which their sewage was disposed of, some of them believing that it was discharged into the bay in its normal condition. I mentioned this to Mr. Benest, who smilingly replied: 'From what I have shown you, you must see that the sewage is too valuable an article for us to throw away if we can avoid it, but you shall see and judge for yourself.' He then explained to me that in time of excessive rains, owing to the flat surface of the city, the storm water (which goes into the sewers) would soon cause an inundation if it were not allowed to escape, consequently arrangements have to be made for its disposal at each station. In such cases it is necessary for a time to open a sluice, instead of attempting to pump it into the tanks, and allow the whole to run into the bay. But whenever it is found to be necessary to do this, the fact has to be immediately notified to the Government Inspector, who visits the station, and when the penstock is closed, writes down the day and date on which it was opened, and signs the document. It is then affixed in such a manner that the penstock cannot be lifted without destroying the notice, and the Government seal is affixed to it."

STEAM-PIPE COVERINGS.

BOSTON MANUFACTURERS MUTUAL FIRE INSURANCE CO. — SPECIAL CIRCULAR NO. 27.

"All the Modern Improvements." — No. 3.

A FEW years since a very exhaustive investigation was made at the instance of the Boston Manufacturers Mutual Fire Insurance Company by Prof. John M. Ordway, then of the Massachusetts Institute of Technology, upon the non-heat-conducting properties of various materials, some of which may be used for covering steam-pipes and boilers, while others, owing to their liability either to become carbonized or to take fire, cannot be directly applied to such use.

There are, however, other problems in preventing either the escape of heat or the ignition of woodwork by the impact of heat, for which purposes various substances are or may be offered to our members. It may not be assumed that because a given material is incombustible it is therefore *not* a quick conductor of heat. Neither may it be assumed that because a material is a quick conductor of heat it may *not* be made use of in some cases for protection against fire.

For instance, given the problem of making a fire-door. If the door be made of two thicknesses of solid wood so adjusted each to the other as not to be liable to warp, this door may be encased in sheet-iron or tinned plates with the joints carefully locked, and it will become a good fire-stop, although both the sheet-iron and the tin-plate are good conductors of heat. The reason of this is, that while the wood, which is in immediate contact with the metal, will be carbonized, yet even the sheets of hot metal, if thoroughly locked, and therefore thoroughly encasing the wood, keep out the oxygen; then, for want of sufficient air to ignite the carbonized wood, the door remains solid and strong for many hours. Thin plates of tinned-iron or steel serve this purpose, where thick plates would warp or bend under heat so as to fail in keeping the door-way tightly closed. Iron doors and shutters are often worse than useless, owing to this tendency to warp or bend, opening a way for fire while obstructing the firemen; also because when heated they do not serve as a guard near which firemen may protect adjacent woodwork. Zinc is worthless as a fire-stop because of its very low melting point. If a door is tinned on one side only, it may be burned about as quickly as if there were no tin upon it, although it may not be ignited quite so soon.

On the other hand, let it be assumed that this same wooden door were encased in asbestos made in thin sheets and strengthened in some way so as to serve the purpose,— yet this covering would be of no value. Asbestos is incombustible, but is is rather a good conductor of heat, as will appear from the subsequent tables; also being

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porous, so that a free passage of air may be given through the interstices, it will wholly fail to prevent a wooden door or surface of wood from being quickly consumed, when laid on in thin sheets or put between floor-plank and boards.

In order that the relative merits of the different substances which are offered to our members for preventing the escape of heat from boilers and steam-pipes, or as substitutes for wire lathing and plastering, or for tin-plates in the protection of elevator shafts, or of woodwork nailed closely to walls, the following tables are submitted. These tables and extracts are taken from a later report made by Professor Ordway to the undersigned. It will be observed that several of the incombustible materials are nearly as efficient as wool, cotton, and feathers, with which they may be compared in the following table. The materials which may be considered wholly free from the danger of being carbonized or ignited by slow contact with pipes or boilers are printed in Roman type. Those which are more or less liable to be carbonized are printed in italics.

Professor Ordway's report is as follows: "Careful experiments have been made with various non-conductors, each used in a mass one inch thick, placed on a flat surface of iron kept heated by steam to three hundred and ten degrees Fahrenheit. The following table (with which the graphical lines in the next column correspond) gives the amount of heat transmitted per hour through each kind of non-conductor one inch thick, reckoned in pounds of water heated ten degrees Fahrenheit, the unit of area being one square foot of covering.

"The first column of figures of results, therefore, gives the loss by the measure of pounds of water heated ten degrees. The second column gives the amount of solid matter in the mass one inch thick. The third column gives the amount or bulk of included or entrapped air." In the graphical table, the value of the non-conducting material is, therefore, in inverse proportion to the length of the line, the short lines showing but a small amount of transmitted heat; the long lines showing the larger amounts.

Substance 1 Inch Thick. Heat applied 310° F.	Pounds of Water Heated 10° F., per Hour Through 1 Square Foot.	Solid Matter in 1 Square Foot 1 Inch Thick. Parts in 1000.	Air Included. Parts in 1000.
1. *Loose Wool*	8.1	56	944
2. *Live Geese Feathers*	9.6	50	950
3. *Carded Cotton Wool*	10.4	20	980
4. *Hair Felt*	10.3	185	815
5. *Loose Lamp-black*	9.8	56	944
6. *Compressed Lamp-black*	10.6	244	756
7. *Cork Charcoal*	11.9	53	947
8. *White Pine Charcoal*	13.9	119	881
9. *Anthracite Coal-powder*	35.7	506	494
10. Loose Calcined Magnesia	12.4	23	977
11. Compressed Calcined Magnesia	42.6	285	715
12. Light Carbonate of Magnesia	13.7	60	940
13. Compressed Carbonate of Magnesia	15.4	150	850
14. Loose Fossil Meal	14.5	60	940
15. Crowded Fossil Meal	15.7	112	888
16. Ground Chalk (Paris White)	20.6	253	747
17. Dry Plaster-of-Paris	30.9	368	632
18. Fine Asbestos	49.0	81	919
19. Air Alone	48.0	0	1000
20. Sand	62.1	527	471

There are some mixtures of two materials which may be quite safe, although consisting in part of substances which may be carbonized. It must also be considered that a covering for a steam-pipe or boiler should have some strength or elasticity, so that, when even put on loosely and holding a great deal of entrapped air, it may not be converted into a solid condition by the constant jar of the building, then becoming rather a quick conductor. This warning may be applied especially to what is called "slag wool," which consists of short, very fine threads of a brittle kind of glass. The following table, giving the figures on which the graphical table is based, has been submitted by Professor Ordway, with the following explanation:—

"The substances given in the following table were actually tried as coverings for two-inch steam-pipe, but, for convenience of comparison, the results have been reduced by calculation to the same terms as in the foregoing table."

COVERING.	Pounds of Water Heated 10° F., per Hour, by 1 sq. ft.
21. Best Slag Wool	13.
22. *Paper*	14.
23. *Blotting Paper wound tight*	21.
24. *Asbestos Paper wound tight*	21.7
25. *Cork strips bound on*	14.6
26. *Straw Rope wound spirally*	18.
27. *Loose Rice Chaff*	18.7
28. Paste of Fossil Meal with Hair	16.7
29. Paste of Fossil Meal with Asbestos	22.
30. Loose Bituminous Coal Ashes	21.
31. Loose Anthracite Coal Ashes	27.
32. Paste of Clay and Vegetable Fibre	30.9

"Later experiments, not yet published, have given results for still air which differ little from those of Nos. 3, 4, and 6. In fact, the bulk of matter in the best non-conductors is relatively too small to have any specific effect, except to entrap the air and keep it stagnant. These substances keep the air still by virtue of the roughness of their fibres or particles. The asbestos No. 18, had smooth fibres, which could not prevent the air from moving about. Later trials with an asbestos of exceedingly fine fibre have made a somewhat better showing, but asbestos is really one of the poorest non-conductors. By reason of its fibrous character it may be used advantageously to hold together other incombustible substances, but the less the better. We have made trials of two samples of a "magnesia covering" contisting of carbonate of magnesia with a small percentage of good asbestos fibre. One transmitted heat which, reduced to the terms of the first of the above tables, would amount to 15 pounds: the denser one gave 20 pounds. The former contained 250 thousandths of solid matter; the latter 396 thousandths.

"Charcoal, lamp-black, and anthracite coal are virtually the same substance, and Nos. 5, 6, 7, 8, and 9 show that non-conducting power is determined far less by the substance itself than by its mechanical texture. In some cases when a greater quantity of a material is crowded into the same thickness the non-conducting virtue is somewhat increased, because the included air is thereby rendered more completely fixed. But if the same quantity is compressed so as to diminish its thickness, its efficiency is lessened; for the resistance to the transmission of heat is nearly — though by no means exactly — in proportion to the thickness of the non-conductor. Hence, though a great many layers of paper, as in No. 23,— prove to be a tolerably good retainer of heat, one or two layers are of exceedingly little service. Any suitable substance which is used to prevent the escape of steam heat should not be less than one inch thick.

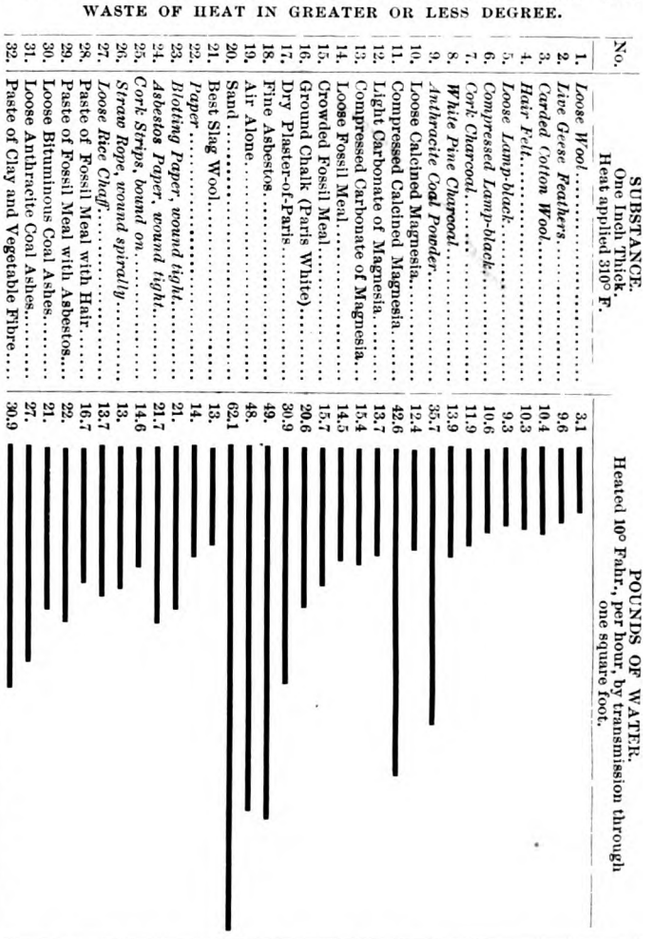
"Any covering should be kept perfectly dry, for not only is water a good carrier of heat, but it has been found in our trials that still water conducts heat about eight times as rapidly as still air."

Respectfully submitted,

EDWARD ATKINSON, *President.*

Boston, December, 1889.

RELATIVE EFFICIENCY OF MATERIALS WHICH PREVENT THE WASTE OF HEAT IN GREATER OR LESS DEGREE.


No.
SUBSTANCE. One Inch Thick. Heat applied 310° F.
1. Loose Wool 3.1
2. Live Geese Feathers 9.6
3. Carded Cotton Wool 10.4
4. Hair Felt 10.3
5. Loose Lamp-black 9.3
6. Compressed Lamp-black 10.6
7. Cork Charcoal 11.9
8. White Pine Charcoal 13.9
9. Anthracite Coal Powder 35.7
10. Loose Calcined Magnesia 12.4
11. Compressed Calcined Magnesia 42.6
12. Light Carbonate of Magnesia 13.7
13. Compressed Carbonate of Magnesia 15.4
14. Loose Fossil Meal 14.5
15. Crowded Fossil Meal 15.7
16. Ground Chalk (Paris White) 20.6
17. Dry Plaster-of-Paris 30.9
18. Fine Asbestos 49.
19. Air Alone 48.
20. Sand 62.1
21. Best Slag Wool 13.
22. Paper 14.
23. Blotting Paper, wound tight 21.
24. Asbestos Paper, wound tight 21.7
25. Cork Strips, bound on 14.6
26. Straw Rope, wound spirally 18.
27. Loose Rice Chaff 18.7
28. Paste of Fossil Meal with Hair 16.7
29. Paste of Fossil Meal with Asbestos 22.
30. Loose Bituminous Coal Ashes 21.
31. Loose Anthracite Coal Ashes 27.
32. Paste of Clay and Vegetable Fibre 30.9
POUNDS OF WATER. Heated 10° Fahr., per hour, by transmission through one square foot.

The loss is indicated by the length of the lines. Incombustible material designated in roman type; material which may be ignited or slowly carbonized indicated in italics.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

OSBORN HALL FOR YALE COLLEGE, NEW HAVEN, CONN. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print issued only with the International and Imperial Editions.]

THE main fabric of this building is of Stony Creek granite, the

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shafts of the columns being polished. Relief is gained by using Long Meadow sandstone for bases, capitals, string-courses, copings, etc.

SUCCESSFUL DESIGN FOR THE AMERICAN ARCHITECT TRAVELLING-SCHOLARSHIP, [1889-90,] BY MR. THEODORE F. LAIST, CINCINNATI, O.

IT has seemed to us best to defer till the present time the publication of the design which secured for its author the honor of being the first holder of the *American Architect* Travelling-Scholarship. The design was prepared in conformity with the following programme:

American Architect Travelling-Scholarship Examination. — Third Paper. — Architectural Design. — A Mansion for the President of the United States.

THIS building is to take the place of the present White House, and $1,250,000 have been fixed as the limit of cost. The building is to provide accommodations for three separate uses:

1. A dwelling-place for the President and his family, containing all the appointments of a private dwelling of the first order and adapted to a family of the ordinary size; who, however, are given to entertaining a constant succession of family friends. This portion of the building must be so arranged that the President's family and his private friends need not be brought into contact with public and official visitors.

2. A second portion of the building must provide a series of apartments suited to the transaction of the President's official business, and must contain the offices of the President, and his private secretaries, clerks, and stenographers. A room for cabinet meetings, reception-rooms, ante-rooms, committee-rooms, toilet-rooms, telegraph-office, etc.

3. A third portion of the building must contain a series of apartments suitable in their design and arrangement to befit the formal state ceremonies which the President's office calls on him to observe. Amongst these rooms must be a hall for state receptions and the receiving of foreign ambassadors, a banquet-hall with the complementary serving-rooms, kitchen, etc., a ball-room suitable for the more select and semi-private festivities the President may choose to indulge in; and also, toilet-rooms, ante-rooms, cloak-rooms, etc.

The area which may be covered by the building does not exceed 80,000 square feet.

REQUIREMENTS: For the preliminary sketch there is required a ground plan, section and elevation to the scale of $1\text{-}32'' = 1'$.

For the preparation of this sketch twelve *consecutive* working hours will be allowed, at the end of which time the sketches must be at once mailed to the *American Architect*, the competitor retaining in his own possession tracings of both plan and elevation as a basis for studying and executing his design at a larger scale.

For the preparation of the final drawings which are to be executed at a scale of $1\text{-}8'' = 1'$, the competitor will be allowed to use all or any portion of three weeks' time.

The plan is to be neatly drawn in ink, blacked-in, and the rooms figured and lettered.

The elevation is to be inked-in and rendered with the brush.

A side elevation must be shown in pencil outline, and the section also may be left in pencil with colored sections. The side elevation and the section may be rendered at a scale of $1\text{-}16'' = 1'$.

INSTRUCTIONS: The preliminary sketches are to be such merely as will clearly exhibit what is to be the general scheme of arrangement of the plan and the general style of the design which the competitor intends to develop.

In working out his idea the competitor is at liberty to modify, condense, expand in any way, or vary the indicated proportions of his sketch, but he may not actually suppress anything shown in his sketch. The general scheme shown in his sketch must be still the general scheme of the finished drawings and the dominant feature of his design must be kept to the end.

On a scale of 10:

Planning will count	4.
Design will count	3.
Drawing will count	1.
Brush work will count	1.
Constructive possibility will count	1.

Saturday, June 8, 1889.

THE MAIN UNIVERSITY BUILDING, STRASBOURG, ALSACE.

FOR description see the communication of the *American Architect* Travelling Scholar elsewhere in this issue.

BLOCK OF HOUSES FOR E. K. GREENE, ESQ., KEARNEY, NEB. MESSRS. FRANK, BAILEY & FARMER, ARCHITECTS, KEARNEY, NEB.

THE HOUSE OF MR. A. H. STEM, ARCHITECT, MINNETONKA BEACH, MINN.

[Additional Illustrations in the International Edition.]

FACADE OF THE OLD ECOLE DE MEDICINE, PARIS, FRANCE.
[Gelatine Print.]

PORTICO ON THE COURT-YARD OF THE ECOLE DE MEDICINE, PARIS, FRANCE.
[Gelatine Print.]

HOUSE IN THE RAUCHSTRASSE, BERLIN, GERMANY. HERREN, KAISER & GROSSHEIM, ARCHITECTS.
[Gelatine Print.]

THE GRAND HOTEL, VIENNA, AUSTRIA. HERR CARL TIETZ, ARCHITECT.
[Gelatine Print.]

"WINTER": FROM THE PAINTING BY NICOLAS LANCRET.

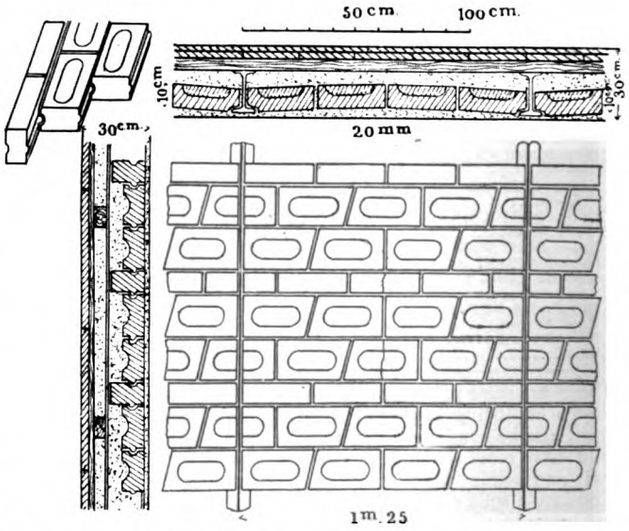
HOUSE, FERNDALE, TUNBRIDGE WELLS, ENG. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG. — THE ENTRANCE FRONT. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG. — THE GARDEN FRONT. THE LATE GEORGE DEVEY, ARCHITECT.

HALL PLACE, TONBRIDGE, ENG. — THE TERRACE. THE LATE GEORGE DEVEY, ARCHITECT.

THE SCHNEIDER FIREPROOF FLOOR.



MR. EDWARD SCHNEIDER, City Architect of Vienna, has invented and thoroughly tested a novel floor, which can be easily understood from the accompanying drawings. He employs the usual iron floor-beams, but fills the intervening spaces with a very flat arch of tongued brick. For a span of 6.56 feet, the rise of the arch is only 1.25 inches. Repeated experiments show that these arches break at the crown before the tongues give way. The Vienna laws require floors to be tested with 400 kilogrammes per square metre, equivalent to 81.925 pounds per square foot. The official reports of the tests show no sinking whatever of the crown under this load. By this method of construction, it is claimed that the thickness of floors is considerably reduced. The bricks weigh about forty-two pounds per square foot, single layer, and cost, in Vienna, fourteen cents per square foot. They have been largely used, and give very satisfactory results.

BUILDING LAW.

ARCHITECT AND OWNER — RIGHT OF DISMISSAL.

DETROIT, MICH.

Question. 1. I wish to obtain your opinion and advice in relation to the duties of a local superintendent or clerk-of-works. Can he be dismissed by the superintending architect for failure to conform to instructions or to carry out plans and specifications when said

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clerk was appointed by a building-committee, consisting of five members of which he is one, the other four being county supervisors, and the work in question a county building? Will it require a majority of the committee to dismiss said clerk?

2. Further can said committee discharge the architect and terminate his contract for the purpose of saving the payment of his fees?

3. Can they be held responsible for full services in same manner as if the building were completed by the architect?

4. Should the building prove a failure and a damage to the architect's reputation through their neglect, could the committee or owners be held responsible for said damages? Is there any law or custom applicable to such cases?

An expression in relation to the above from the *American Architect*, would I think interest many of its Western subscribers.

Yours truly, APPRECIATIVE READER.

Answer. 1. Only the committee can dismiss him unless they have previously given the architect authority to do so, but architects almost always ask for, and have, this authority.

2. Certainly the committee cannot discharge the architect and terminate his contract "for the purpose of saving the payment of his fees." But on the other hand, of course, they would never admit that they were doing anything of the kind; some other and more plausible excuse would be alleged.

3. The dismissal of an architect without cause is a breach of contract, and the measure of damages would certainly be figured at the usual commission on the amount of work actually done. Whether the architect could collect further damages to the extent of the entire loss of the profit which he would have made out of the transaction in case the agreement had been carried out on both sides, depends in the first place upon what kind of an agreement he could prove had been entered into by the parties, and secondly, upon the general and still undecided question of whether the contract of an architect is to be assimilated to mercantile undertakings. The question has been discussed before in these columns. The general drift of legal opinion is to the effect that the contract of the architect is purely a business undertaking. In that view of the case he would be entitled to collect the entire amount of net profit which he could show would have accrued to him from the enterprise if completed according to agreement. This would not, however, mean his "full services" if by that is to be understood five per cent, but would be got at by deducting from the full fee of five per cent, the expenses that the architect would be put to in the way of draughtsmen, etc., in earning it. This view has the sanction of decisions.

4. There is no ground, in our law at least, on which an owner or building-committee can be held responsible for damages to an architect's reputation through violating his opinion and deviating from his plans. In France, where they manage things differently if not better, there is some reason for thinking that an action of the nature indicated would lie; but certainly none could be maintained under the English common law.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

DUTIES OF A CLERK-OF-THE-WORKS.

ASBURY PARK, N. J., February 17, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — Reading the article in your issue of February 15, headed "The Clerk-of-the-Works," leads me to ask the question: What are the requirements to fit a man for the position of clerk-of-the-works? As it is generally on very large buildings only that a clerk-of-the-works is employed, there are only a few architects, comparatively, that have anything to do with a clerk-of-the-works, and I think it would be interesting to the bulk of the profession if you would define his duties.

Yours very truly,
J. W. ROBERTS.

[CLERKS-OF-WORKS are usually young architects, recommended for the position by the architect of the building, but there are many professional clerks-of-works, who prefer to devote themselves entirely to that sort of service, and have no other career in view. The duty of a clerk-of-works is to try to detect mistakes or misconduct, if any, on the part of the contractors or workmen, and, in general, to guard the interests of the owner in details which are out of the architect's province, looking out for day-work, keeping a record of progress, and so on. — EDS. AMERICAN ARCHITECT.]

THE UNDERSTANDING BETWEEN ARCHITECT AND CLIENT.

CHICAGO, ILL.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — I notice in your issue of December 28, a case which was decided against an architect who seems unwittingly to have guaranteed the cost of a building before the builders' estimates were received. I find in my own practice that it is best to meet the matter at the start, and for the benefit of those who are not afraid of "losing the job" by taking a firm stand, I would say that I find the enclosed form of "Client's letter" to cover most cases.

Very truly yours. WILLIAM W. CLAY.

CLIENT'S LETTER.

Chicago, ——— 188 .

Dear Sir:— To avoid misunderstandings that sometimes arise between client and architect in regard to compensation in case the client should not proceed with work after drawings are made, either in consequence of an excess in cost or from other causes over which the architect has no control, and because it is impossible to ascertain the cost of any work except by judgment until the plans and specifications have been completed and a basis thereby made for the accurate determination of the cost, I feel that it is but justice to myself and my clients to inform them at the beginning that while I shall earnestly endeavor to secure for them the best result for the least amount of money, I shall expect a reasonable compensation whether the work proceeds or not.

In case the work does not proceed upon the basis of the drawings made, the compensation charged will be two and one-half per cent upon the approximate estimate the same being due when the bids are opened or the decision not to proceed rendered. Should the work progress, three per cent will be due upon the actual estimates furnished, and bills will be rendered not more frequently than once a month during the progress of the work for five per cent upon the expenditure to date less the previous payments. The total compensation being five per cent for full professional services upon the entire cost of the work including the cost of everything necessary to its occupancy for the purposes intended whether contracted or purchased through the architect or by the owner individually; and an additional charge of five per cent will be made for any special designs, as for mantels, stationary furniture, decorations, etc.

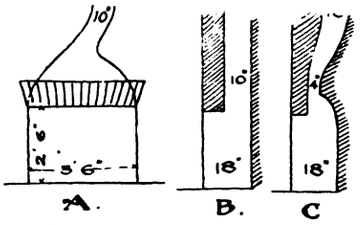
The approximate cost of the work proposed by you is agreed to be $ ———

Respectfully yours, ———

THE OPEN FIREPLACE THROAT.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — There are different views as to the best construction of open fireplaces, where the flues start. I should like to be favored with your ideas and those of any of your readers as to the best arrangements to ensure a good draught. We will suppose an open fireplace 3′ 6″ wide x 18″ deep. In how far does the height of the opening govern the draught? Would you make the throating (front-view) as gradual as possible as at A and full width of flue (there will be 10″ diameter of flue-linings) as at B or do you approve of making a long narrow opening to flue by inclining the back forward as at "C." Your comments will be much appreciated. Respectfully, "SMOKY FIREPLACE."



[Neither of these sections shows a good fireplace. Eighteen inches is hardly deep enough for a fireplace 3′ 6″ wide: we should make it 20″ at least, for the reason that, with such a very wide opening, there is danger that currents of cold air will rush in at the sides of the fireplace, at times when there is only a small fire burning in the middle of it, and, rebounding again, bring smoke with them into the room, unless the depth is great enough to allow the column of smoke to move backward and forward without escaping. For the same reason, the height of the opening should not exceed two and one-half feet, as, if it is higher than this, the smoke from coal in a grate, or wood on andirons, will puff out before it can rise high enough to come within the influence of the draught of the chimney. For such a fireplace as is described, moreover, a 10-inch flue-lining is much too small. "Smoky Fireplace" does not say whether he intends a square or round one, but neither would be large enough. The safest way is to make the flue, if nearly straight, equal in sectional area to not less than one-eighth the area of the fireplace opening, and even this is too small if the flue is crooked, or unless it is either lined or smoothly plastered inside. The throat should be drawn in more gradually in elevation than is shown in sketch A. The greater the height that can be given the taper, the better the fireplace will be. In section, both B and C would be bad. A fireplace like B would smoke at all times, as every puff of smoke that happened to come out a little beyond the others would strike on the underside of the opening, and be conducted into the room; while C would smoke whenever a down-draught occurred, which is sure to happen more or less frequently, according to circumstances of proximity of higher buildings, hills or trees. The proper section is like this: The throat should be only two inches wide, to confine the hot gases, and prevent cold air from rushing up the chimney with them; and it should be at least six inches above the top of the fireplace opening. Moreover, there should be a flat shelf behind the throat. Then, in case of down-draught, the current will strike the shelf, and rebound upward, instead of being simply deflected forward into the room. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

HAY FUEL. — A gentleman who has recently been travelling in Nebraska writes: "I recall, with many pleasant memories, our hunting trips to the great plains in pursuit of the buffalo, elk, deer and antelope.

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Do you remember, as the sun sank to rest each night, how we, in the absence of wood, quickly gathered, in the twilight, our stock of unromantic buffalo chips, and how these same despised chips afforded us light, warmth, and the wherewithal to cook our meals? Verily the buffalo and the chip have about vanished from the face of the earth for ever; but, at the town of Pender, Nebraska, these pleasant trips were recalled, by seeing our old friends, the buffalo chips, in an embryotic form as it were, used as fuel. In plain English, the firm of W. B. Warrington & Company was operating a flour-mill at this point, using an 8 1-2 x 8 (35-horse-power) Westinghouse automatic engine to drive the mill, and their fuel was hay. The whole plant was a surprise to me, as I did not before realize that flour could be made profitably on so small a scale, the engine's capacity being about 35 horse-power! Mr. Warrington informed me that coal cost six dollars per ton at Pender, and that his little Westinghouse engine was making forty barrels of flour on 1,800 pounds of hay, costing two dollars per ton. He stated that he also at times used cobs, straw, etc., for fuel, but never coal. It will be noted that this firm makes a barrel of flour on 4.5 cents' worth of fuel, which is not a bad record for any 35 horse-power engine. Mr. Warrington, on being asked to substitute another engine, said, 'My Westinghouse suits me first rate.'" — *Invention.*

Land Values in Milwaukee. — Ex-Governor Ludington owns the lot on the northwest corner of East Water and Wisconsin Streets. It has a frontage of sixty feet on East Water Street, and a side front of 143 feet on Wisconsin Street. On this lot stands a building, the value of which, on account of its age, is estimated not to exceed $20,000. An east side capitalist offered Governor Ludington $200,000 cash for this corner. The Governor has been considering this offer for two weeks past, in his winter home at Thomasville, Ga., and concluded not to accept it, as he deemed the price insufficient. The person who made the proffer intended to erect a two-hundred-and-fifty-thousand-dollar building on the lot, in which was to be included a superb banking-house. The offer for the land is virtually $3,000 per foot front, the highest price offered for land in Milwaukee since the foundation of the city, and $1,000 more per foot than has been offered for any site on the west side. The Ludington corner is a most desirable one, but many think no better than some other corners in our city. Fifty-five years ago a lot for which is now offered $180,000 sold for $5,000. As the lot has always brought at least twelve per cent net per annum on the original investment, including the cost of improvements, some will remark that owning a wisely-selected corner-lot in the city of Milwaukee is about as good as owning a California gold mine. — *The Milwaukee Wisconsin.*

The Test of the Forth Bridge. — The Forth Bridge was tested January 21. The official report is as follows: "Sir John Fowler and Mr. Baker, engineers of the Forth Bridge, have to-day tested the two 1,700 feet spans by placing on the centres two trains, each made up of fifty loaded coal wagons and three of the heaviest engines and tenders, the total load thus massed upon the span being the enormous weight of 1,800 tons, which is more than double what the bridge will ever be called upon in practice to sustain. The observed deflections were in exact accordance with the calculations of the engineers, and the bridge exhibited exceptional stiffness in all directions." The London *Railway News* says the trains were each arranged with two engines in front and one in rear, the length of train being about 1,000 feet. As the north and south cantilevers measure each above 1,500 feet over all, and the Inchgarvie cantilever is 115 feet longer, the trains, when centred on the piers, filled up about two-thirds of their length. When the head engines reached the end of the central or suspended girder, the tail engines had left the centre of the cantilever, the entire weight being thus thrown upon the arm and centre girder. The load put on the bridge was more than double what will ever be upon it in practical use, but it indicates the vastness of the structure to learn that even this exceptional load only amounted to 10 per cent of the gross weight of each cantilever, and about 3 per cent of of the entire bridge. In regard to wind-pressure, it is stated that during a recent heavy gale, when the wind-gauges on Inchgarvie recorded a pressure of thirty-seven pounds per square foot, the maximum lateral movement of the centre cantilever was less than one inch. The bridge is to be formally opened by the Prince of Wales on March 4. — *Engineering News.*

Italian Pirating of Sculpture. — "Sculptors are greatly annoyed," says the Paris correspondent of the London *Daily Telegraph*, "at the Italian pirates who have been imitating their best works and inundating France, England, and the United States with terra-cotta reproductions of some of the best examples of French statuary art. The visits made by the police to the work-shops of the Trans-Alpine contrabandists have led to some remarkable revelations respecting the ways and means of the 'sculpture pirates.' At the house of one Gasparini, a moulder of Montreuil, there were found eight imitations of Falguière's 'Diana.' Another moulder named Gonella was equally active in audacious piratic operations, but the palm will be accorded to a person called Giacometti, who has realized a considerable fortune by his artistic piracies. Giacometti kept a large establishment on the banks of the river, and made a specialty of reproductions from the Museum of the Luxembourg, which were copied for him by two young sculptors."

Sandy Foundations. — A process of preparing foundations has been patented by F. Neukirch, of Bremen. Its object is to make loose sand firm and resisting as solid rock. At present the universal method of doing this work, if under water, is to remove all loose material and then make a beton or other similar sub-structure. The process under consideration, which is only of use where the materials are fairly clean siliceous or calcareous sand, aims at consolidating the grains by covering them with a film of cement, which is forced into the spaces between the particles by compressed air, steam, or water under pressure. Sheet piles are employed to prevent the spreading of the cement over more ground than is necessary. The system has been largely used in the harbor of Bremen, and is to be tried in preparing dry foundations. — *The Architect.*

The Explorations in Mesopotamia. — The Americans who are exploring and excavating in Mesopotamia have every reason so far to be satisfied with the results. At Niffer, the Nipur of the ancients, they have laid bare the temple of Bel — a very fine one — and have found inscribed tablets which date back to about 3750 B. C.; and at Ur, in the great temple library, they have discovered many inscribed tablets, cylinders and bricks of first-rate religious and historical importance. — *New York Evening Post.*

A Hotel at the Pyramids. — In Egypt, at the Pyramids of Gizeh, where a hotel has just been built, the temperature for February varies from 49 degrees to 65 degrees in the shade, the average for the month being 57 degrees, and the lowest bedroom temperature without a fire never being below 55 degrees. The humidity is only 66 per cent, and rain and fog are almost unknown. — *New York Evening Post.*

Glass-lined Tubes for Underground Wire. — Parties have been experimenting for several months at the Pendleton, Ind., gas works, in order to perfect a method of constructing glass tiling or tubes for use of underground wires. On the strength of results a company has been formed representing a capital of $500,000. — *Sanitary News.*

A Paper Hotel. — The experiment of constructing a large building chiefly of paper has been successfully made at Hamburg, where an immense hotel, with its façade and other important parts composed of that material, has been erected. It is claimed that the building is absolutely fireproof and also impervious to the action of the elements which render brick, stone or wood unsightly or unsafe under prolonged exposure. — *Nashville American.*

Beryt or Fluid Marble. — The Austrian sculptor, Friedrich Beer, in Paris, has discovered a process for making marble fluid and moulding it as bronze is moulded. The name of the marble thus treated is beryt. The new product costs little more than plaster and is especially well adapted to the ornamentation of houses and the construction of floors, baths and small pillars. A stock company has been organized in Paris to place beryt on the market. — *Boston Transcript.*

TRADE SURVEYS

The salient features of the leading markets during the past few days, indicate that there is a growth of the conservative feeling in business circles which began to manifest itself early in the year. Reports from all financial centres show that while there is a sufficient supply of money, there is not enough to admit of speculation. Prices in some directions are weakening, and in others, hardening. According to some authorities, there will be a reaction from present high prices to lower ones; on the other hand, it is claimed that present influences are all working in the direction of a higher range of prices than we have ever yet reached. The intelligent reader of market reports is in a quandary to know what view to take. The fact of the matter is, that the opinions of individuals, no matter how logical they may appear to be, generally rest upon mere surmise, or at best, upon very sandy foundations; there are so many things to consider; so many unexpected influences developed; so many circumstances, unforeseen by the average business man, constantly arising, that it is largely guesswork to say how things are likely to go for the next thirty days. The safer plan is, simply to gather, and as carefully as possible, digest the material available. No matter in what direction we look, we find producing interests actively at work gathering stocks and supplies and equipments for future demands. Fortunately, the great majority of these active individual and corporate managers have money enough to pay wages and buy material, and carry themselves over the waiting period. The general markets are characterized as waiting ones, and in many respects they are; but those who wait the longest, run the greatest risks. The most conservative view of the situation justifies the opinion — although it must be expressed with a good deal of diffidence — that there will be a remarkable expansion of demand during the months of March, April and May; all conditions on the surface point that way. If activity does not result, in these months, the present indications are deceptive.

No matter what branch of industry may be taken, or channel of commerce investigated, or avenue of activity considered, the same rush of preparation, the same confidence and energy, are manifested. Even the boot and shoe manufacturers claim to be farther behind their orders than usual. The house-finishers are extraordinarily busy. It is safe to assert that there will be ten per cent more house-room constructed this year than last; it is also safe to assert that the railroad companies will do a great deal more terminal work and track-work than they did last year. All through last year a spirit of unwise, or rather, doubtful, economy ruled in railroad-building circles, but the Boards of Directors, in their meetings held during the past month or two, have directed that a new policy be entered upon, and that more liberal expenditures be made in the way of repairs, equipments and construction requirements. This stimulus has already been felt in the iron and lumber trades, as well as among those who supply equipments and supplies. In the far West, the symptoms, so far as they can be seen, are favorable. In certain quarters, the claim is made that the agricultural interests are suffering from low prices, dull markets and high freight rates. A careful examination of the facts would undoubtedly show that the agricultural interests have been too rapidly expanded, or rather, expanded out of proportion to development of other interests in those sections, as well as in other sections of the country. The miners are generally very busy outside of the anthracite coal fields. The price of coal has dropped in both Western and Eastern markets. Bituminous coal is crowding its way into the New England States, a fact which the anthracite managers are realizing. The iron trade is moderately active; summer requirements are being covered very cautiously.

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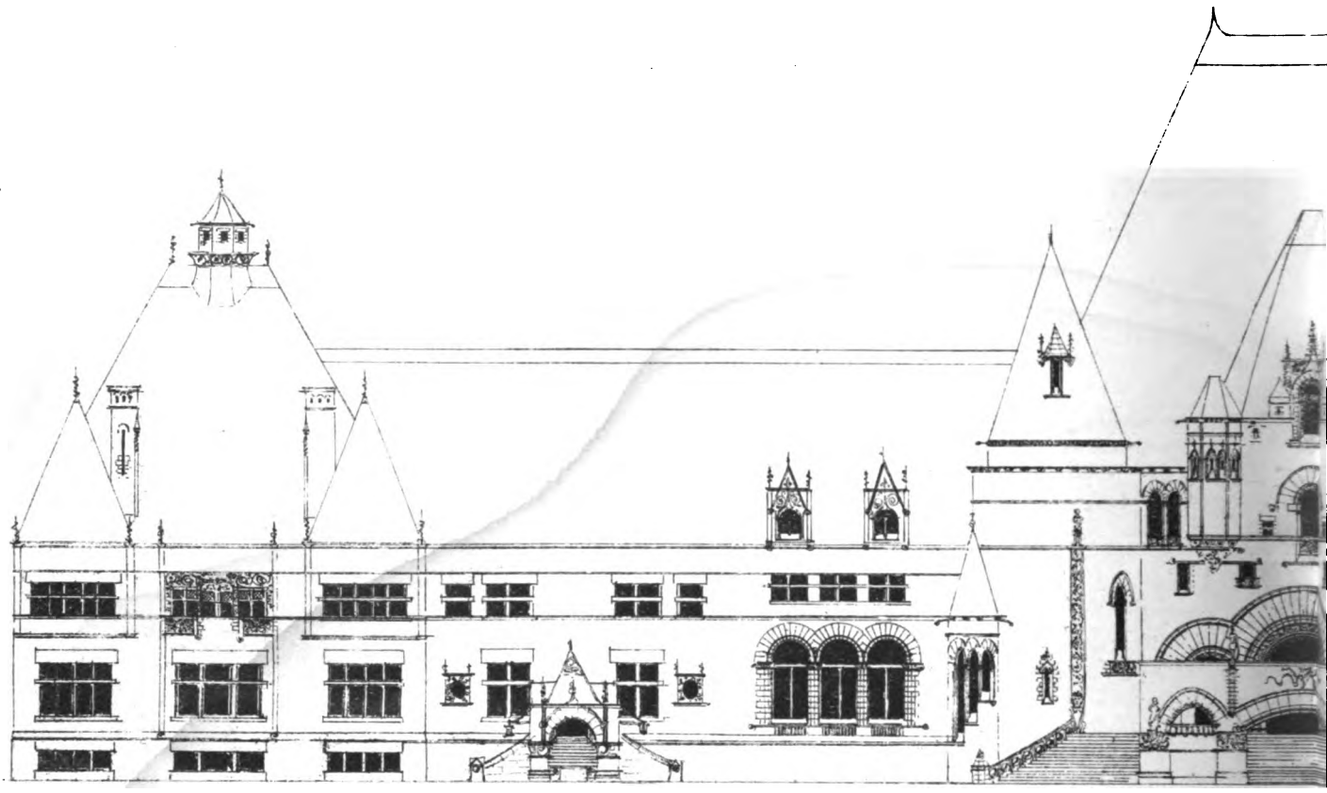

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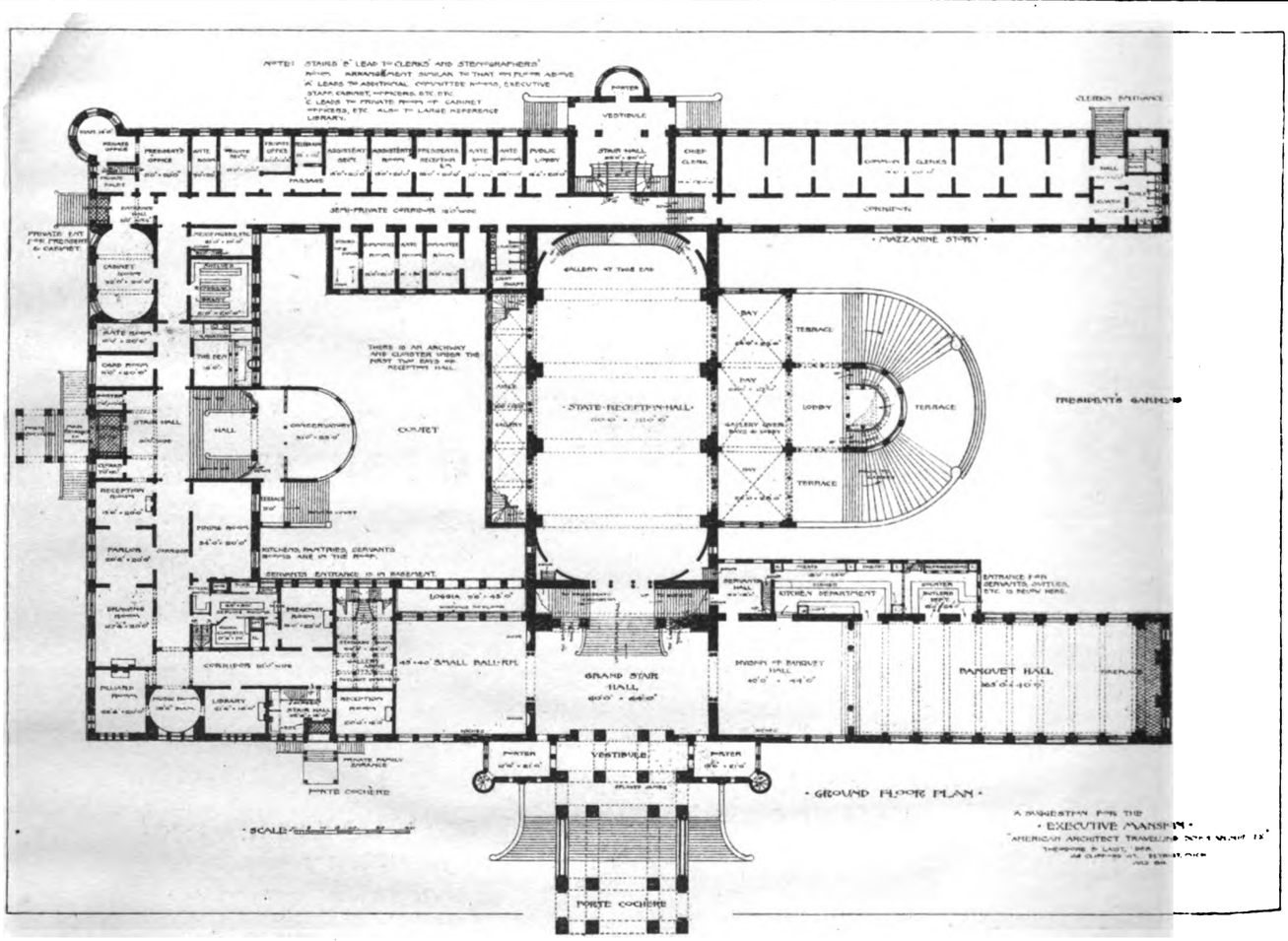

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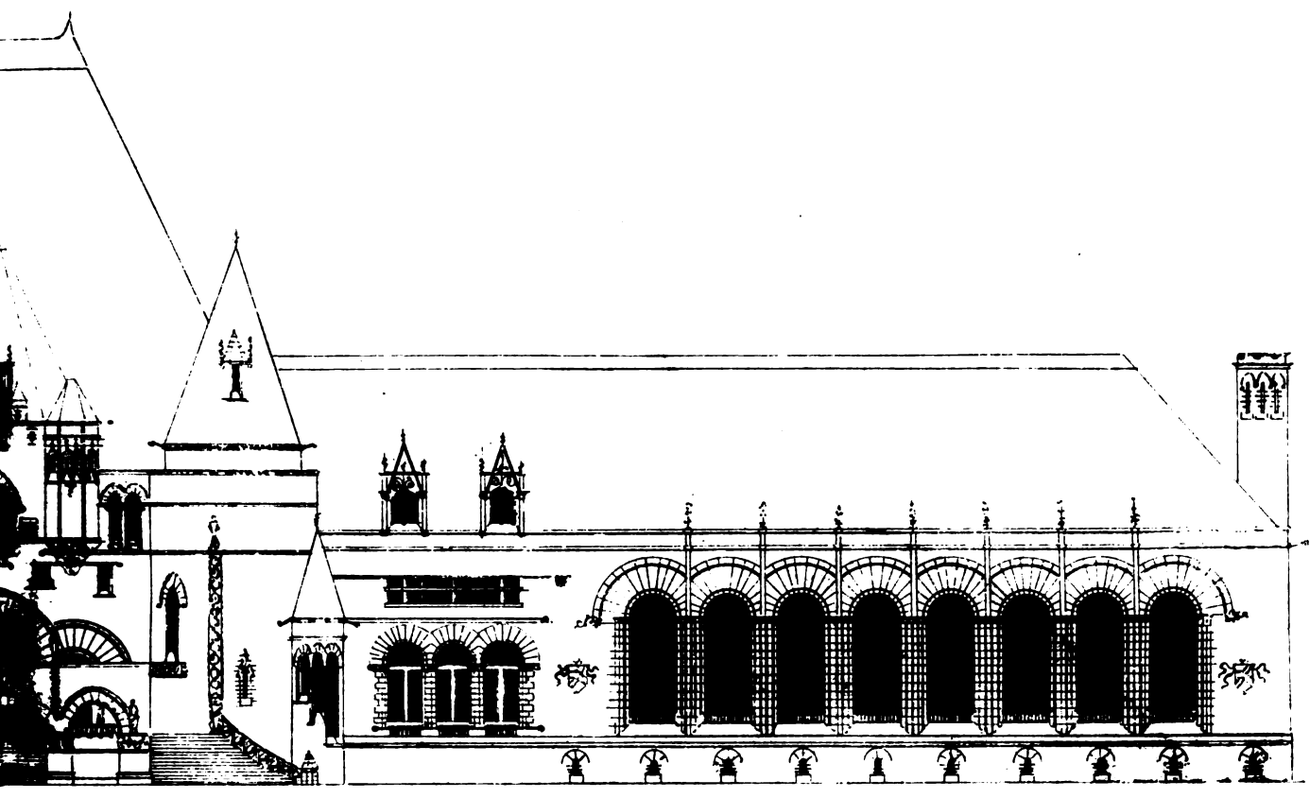

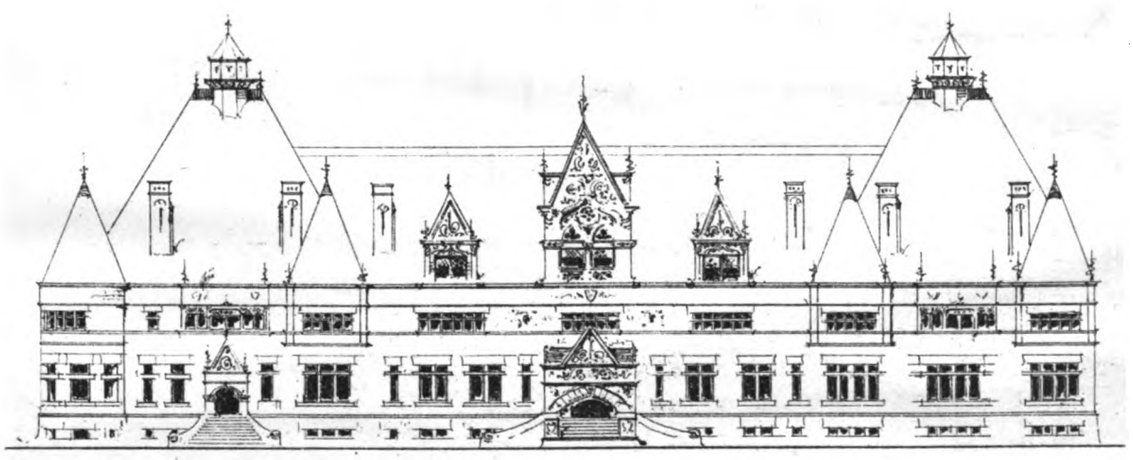

END ELEVATION

A SUGGESTION FOR THE EXECUTIVE MANSION

"AMERICAN ARCHITECT TRAVELLING SCHOLARSHIP EX."

THEODORE F. LAIST, DES.

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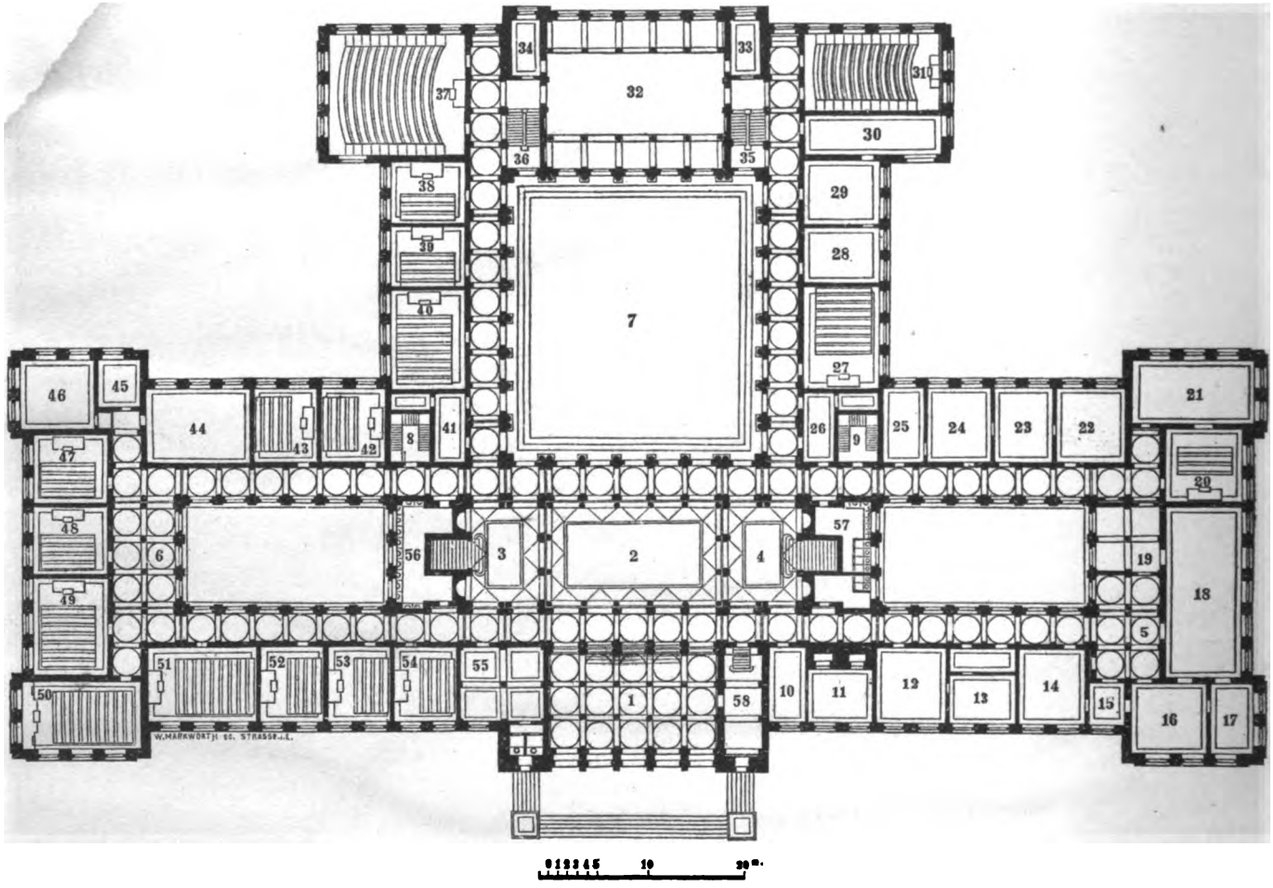

Plan I.

MAIN BUILDING OF THE UNIVERS

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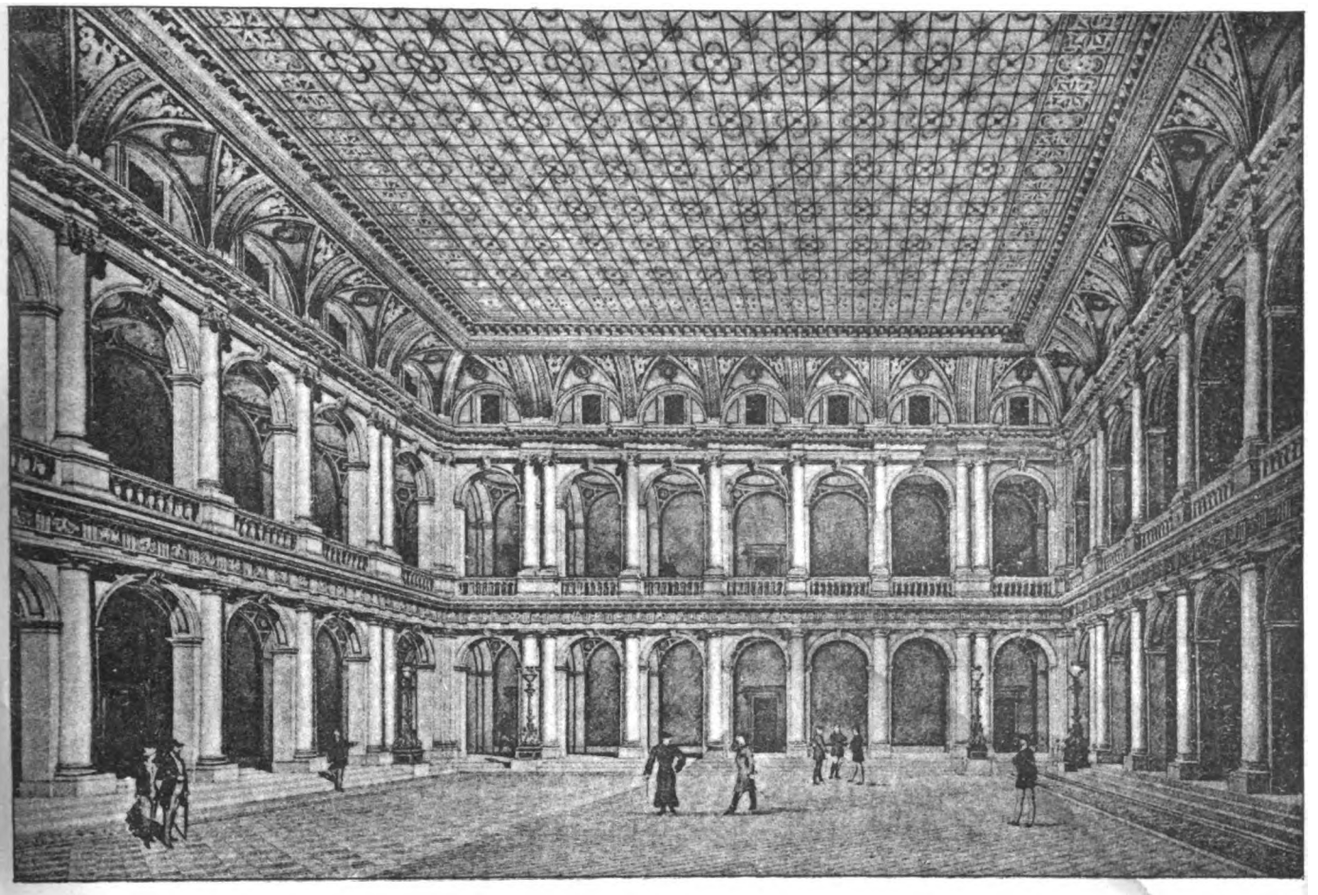

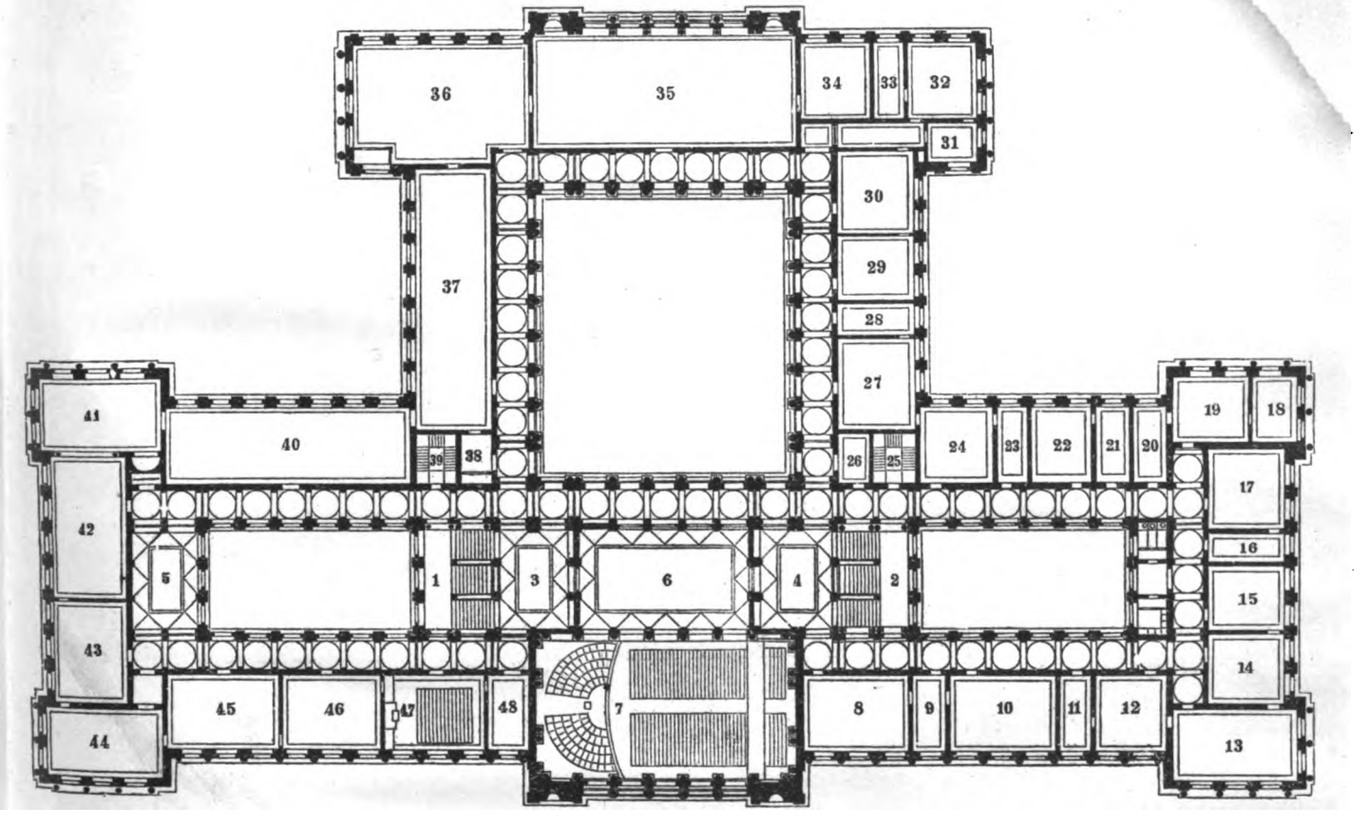

Plan II.

ITY, STRASBOURG, ALSACE.

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BLOCK OF HOUSES FOR MR E.K. GREENE.
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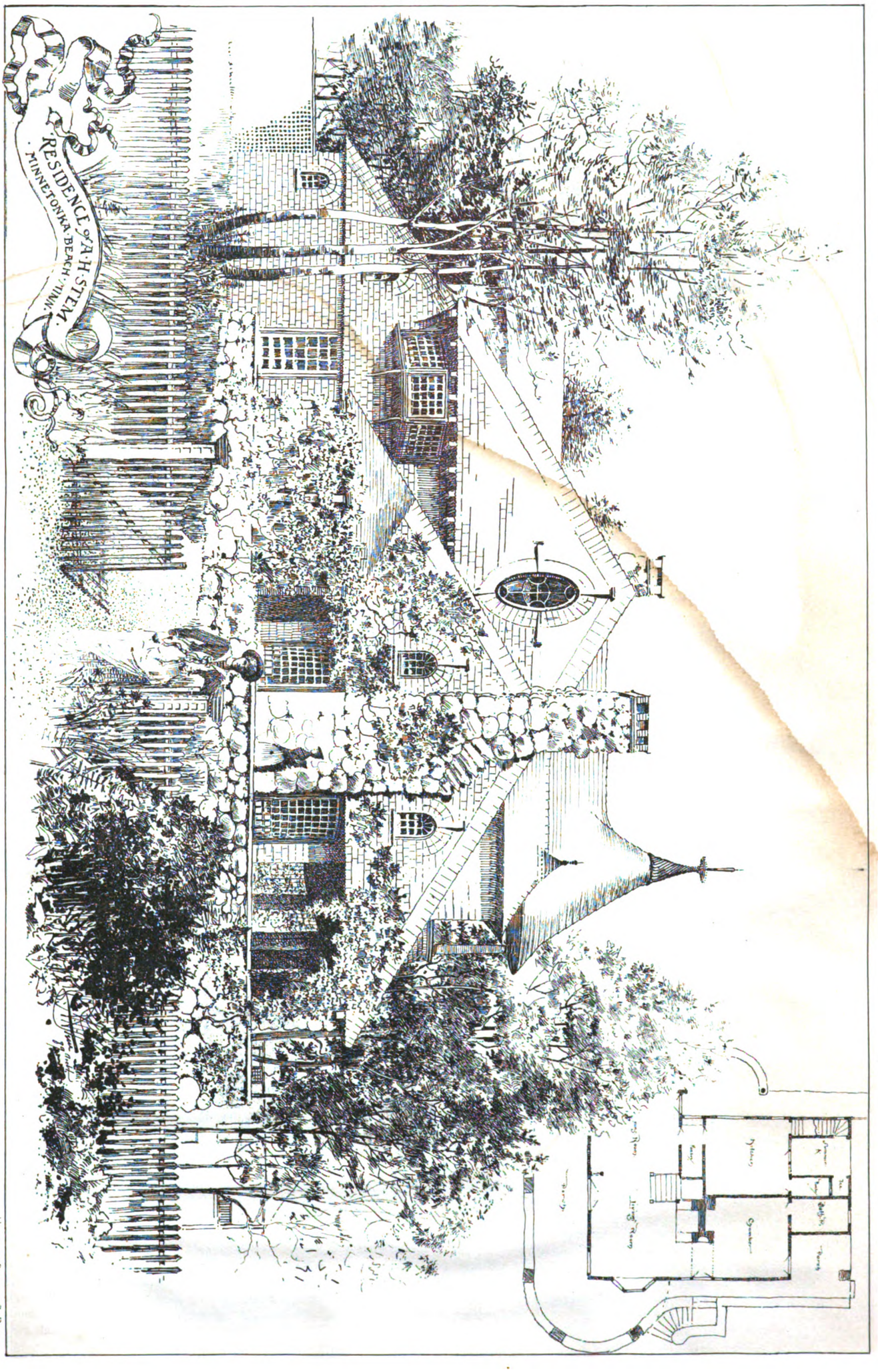

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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MARCH 15, 1890.

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THE Master Builders' Exchange of Philadelphia seems to have been getting the architects of that city into an excellent state of discipline, to judge from some of its recent doings. Not long ago, a firm of architects, Messrs. Furness, Evans & Company, invited estimates for a large building, all the work to be taken under one contract. Seven builders sent in proposals on this basis, but the architects, acting, as they say, under instructions from their clients, invited separate estimates from various sub-contractors. For some mysterious reason, this proceeding aroused great indignation among the builders. One of them, at a meeting held to consider the matter, said that he considered it as bad as if a man should go to a tailor, and ask him the price of a coat, and should then ascertain the price of the necessary cloth, and should ask the journeymen what their wages would be for the time required for making it up. We should have said that this was exactly what every prudent man would do in regard to matters more important than coats; but the Philadelphia builders appear to think that architects and owners ought to have souls above such sordid attempts to get their money's worth in building affairs, and Messrs. Furness, Evans & Company received a sharp admonition from the Exchange. They replied with moderation, explaining that they acted under instructions from their clients; and the Exchange then voted that all the bids should be withdrawn, until the owners of the proposed building should decide definitely whether to make one contract for the whole work, or divide it into several contracts.

WE imagine that the owners will not be quite so tractable as the architects, and that they will simply invite bids in such manner as they may see fit from builders outside of Philadelphia; and, in fact, the Exchange seems to have thought so too, for, after disposing of this matter, it turned to the architects again, as if by way of consoling itself for the unruliness of the public, and jerked them up sharply in regard to the habit now prevalent among them, of specifying particular brands of lime. Naturally, people with lime to sell, of brands either unknown, or unfavorably known, to the architects, feel annoyed when a specification restricts the contractor to a certain list of brands, of which theirs is not one; but, as we pointed out recently, this is not the fault of the architects, who always with to get for their clients the benefit of competition between several sorts of materials, known to be equally good, but of the dealers and the builders, the former of whom usually try, when no brand is specified, to unload their worthless and unsalable stock upon an architect whom they presume, from the looseness of his specification, to be ignorant; while the builders, instead of testing the lime for themselves in such cases, accept and use anything that the architect does not happen to detect and order off the ground. However, the Philadelphia architects are not to be allowed to follow their own judgment in this, any more than in other matters, and a resolution was adopted, and referred to the Committee on Architects, Plans and Specifications, ordering a "conference" with the Philadelphia Chapter of the American Institute of Architects "with a view of so arranging specifications on this point as to permit a healthy business competition by all dealers in equal grades, by specifying a particular make of lime, or grade equal thereto." We trust that the "conference" will end in the peremptory refusal of the architects of the Philadelphia Chapter to allow the dealers in lime to dictate to them how they shall write their specifications. If any dealer sells a brand of lime which is always as good and fresh as the Knickerbocker, or Cedar Hollow lime, his proper course is to prove its good qualities by showing them, patiently and persistently, to the architects, until he has won their confidence sufficiently to induce them to add that brand to their approved list. Then his market is secure, and he will by degrees come to reap the reward of those who can be depended upon for a good building material; but the attempt to force unknown and suspicious materials down the architects' throats, or to compel them to receive, at their own peril, any sort of miscellaneous stuff that the dealers choose to assert to be "equal" to some known brand, and to go through the labor and annoyance of testing it for themselves, ought to fail ignominously, and will probably do so.

THE lock-out in the freestone-cutting trade in Boston promises to be rather a serious one, the freestone cutters of that city being kept under strict subjection by their leaders, who have shown themselves to be both obstinate and unscrupulous. Curiously enough, the fight was originally one among the workmen themselves. Certain marble-cutters undertook to work on the stone for a marble building, but were hustled out of the way by the freestone-cutters, who announced that they would cut the marble themselves, and would allow no one else to do it. This seems to have been a piece of pure insolence toward the marble-cutters, who were too weak to resist, and the contractors took up their cause, and gave notice that they should defend the right of marble-cutters to work on marble buildings. Thereupon the freestone-cutters threatened rebellion, and the contractors, finding that a struggle was inevitable, added to their claim another and very just one, to the effect that skilled freestone-cutters ought to be allowed to join the Union, on complying with its rules, instead of being kept out, as is now the case, so that the present members may enjoy a monopoly of the trade, at their own prices, while the contractors and builders suffer endless delays and losses, on account of the impossibility of getting men enough to do the work offered. The leaders of the Freestone-cutters' Union seized the opportunity to display the usual Union tactics. The men were informed that the contractors did not really want to provide employment for the marble-cutters, or for more freestone-cutters, but secretly intended to reduce wages and keep up long hours of work. This assertion was, as usual, received by the workmen in the same way that the waving of a red flag would be by a herd of bulls, and apparently with about as much intelligence in inquiring into its truth as the bulls would display in ascertaining whether the red flag denoted unfriendly feeling or not. Even the poor marble-cutters, hearing that their wages were to be reduced, and forgetting that the lock-out was ordered expressly because the freestone-cutters would not allow them to work at all, joined their weak forces with those of their tyrants against the contractors who were trying to befriend them, and stone-cutting is now nearly at an end in Boston. The claim is said to have been made that all the other building trades were ready to support the freestone-cutters, but this is very unlikely. The reputation of the freestone-cutters for quarrelsomeness and violence is too well known to gain them friends among the more sober Unions, and men with common-sense will see that there is no probability in the assertion that the contractors have any sinister ends to gain by the lock-out, or any possibility of gaining them if they had such ends in view; while the demands which the contractors actually make are obviously fair and reasonable.

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THE question of requiring architects to prove their professional training before they are allowed to practice is growing more and more pressing in France, and, on the suggestion of the Director of Fine Arts, M. Larroumet, a Commission has been appointed by the Ministry of Public Instruction, charged with the duty of inquiring and reporting whether an official examination, followed by the award of a diploma, would tend to improve architectural design and construction; whether it would injuriously hamper art and artists; whether it should be optional, obligatory, or obligatory only in certain cases, and whether country architects should be subjected to the same rule as those in cities. Supposing a diploma of some sort to be desirable, the Commission has next to consider whether it should be called simply a "diploma," or a "patent," "license," "degree," "certificate," or something else; whether it should be awarded only as the result of examinations, or, in part, through other considerations; what should be done in regard to architects already in practice; whether the possession of the diploma should be necessary for employment on public works, or for recognition as an expert by the courts; how, or when, a diploma should be revoked or suspended, and so on. The President of the Commission is M. Larroumet, the Director of Fine Arts, the two Vice-Presidents are Bailly and Charles Garnier, and among the members are M. Dubois, Director of the Ecole des Beaux-Arts, M. Eugène Guillaume, Inspector-General of Museums, and of Public Instruction in Drawing, and the architects André, Lisch, De Baudot, César Daly, De Joly, Normand, Mayeux, Roussi, Journoud, Chevallier, Marteau, Bourdeix, Daumet, Trélat, Hermant and Héret; besides M. Périn, a distinguished lawyer, who is noted for his skill in cases concerning building and architects; M. Mulle, also a distinguished lawyer, and Professor of Building Legislation at the Ecole des Beaux-Arts, and M. Crost, Chief of the Bureau of Museums and Teaching in the Administration of Fine Arts. It is hardly necessary to say that a better commission for the study of this extremely important question could hardly have been chosen, and the profession, particularly in our own country, where circumstances are, in this respect, very similar to those in France, will look for the result of its deliberations with the deepest interest.

TWO or three schemes are now under discussion for clearing away the houses around the Cathedral of Cologne, so as to leave it standing in an open space. It is already much more completely detached than most churches in the Continental cities, but the plans contemplate removing the block of buildings opposite the Hôtel Ernst, and also the houses adjoining the Dom-Hotel, on the other side of the Cathedral, leaving those two hotels facing directly on the new open square, which is to be laid out with grass and shrubbery. As a finishing touch to all this modernization, one scheme proposes to destroy the large block of houses which now stand between the Cathedral and the railway, and build in place of them a grand station, facing the Cathedral square. We do not suppose that a little, piping American voice like ours would be any more regarded in Cologne than the chirp of one of the Cathedral sparrows, but we wish, just the same, that the Cathedral and its surroundings might be left alone. Most architects do not need to be told that any great building gains immensely in interest and dignity by being only partly seen beyond or above some other building, but if there are any who doubt this, they need only look at the nearest church spire, first from an open space, and then with some object interposed, to be convinced. Independently of this, however, the clustering of houses around the mediæval churches gives them a peculiar sentiment and interest; or, as we might say, helps to invest them with the light of the Lamp of Memory. Seven hundred years ago, notwithstanding all the corruption of the priesthood, the church was to the laity the entrance and image of that heaven which all, rich and poor, nobles and slaves, had frequently in their thoughts. With it was connected the sacred happiness of which their robust faith accorded them so many moments; and even after death their bodies were crowded together in the churchyard around the walls, where the drip of the rain from the blessed eaves might convey to them peace and protection from the infernal powers. In the cities, where space was limited, the houses came close to the walls, and, although the abuse of building against the church was the product of a subsequent, and more unfeeling age, nearly all the mediæval cathedrals of the Continent show that they were designed to be surrounded by narrow streets, and to have a somewhat larger space in front. Thus, in Paris, the sculpture of the side doorways is so delicate and small in scale that it can hardly be understood ten feet away, and that in front is comparatively bold, while both in front and on the sides, the cornice sculpture, the gargoyles and balustrading, which would be visible to half the thirteenth-century Paris above the surrounding houses, is on the largest and most effective scale. So in a dozen other churches; the work at the sides is perfectly adapted to close examination; that in front to a more distant view, while the upper portions are calculated for an increasing range, to the spires, which are perhaps most beautiful a mile or more away. The destruction of the conditions under which the designers of these structures expected and intended that they should be seen would be a questionable undertaking in any case, and experience shows that, where it has been carried out, the result has been unsatisfactory. It is not many years since the space in front of Nôtre Dame in Paris was cleared of buildings, just as is now proposed for Cologne, and we think that French architects agree that the Cathedral has lost greatly in effect in consequence; and there are many similar instances of the inapplicability of bald "Haussmannization" to the improvement of works of art so refined in effect, and so studied in sentiment, as the thirteenth-century churches.

AN article, signed with the well-known initials of M. Emile Rivoalen, gives, in *La Construction Moderne*, a frank but appreciative account of the late M. André's career as professor in the School of Fine Arts. It is curious to find that André himself, so noted for his fondness for large, striking effects, was a pupil, first of Huyot, and afterwards of Lebas, whom M. Rivoalen calls the Classicist *par excellence* of the architectural teachers of his time; but both Lebas and André, although Classicists to their fingers' ends, had nothing of the uninventive pedantry of some of their English and German rivals. On the contrary, they were so much at home with Roman methods and forms that they were able to use them as the Romans would; that is, with simplicity, breadth and that happy adaptation of means to ends which is the mark of the thorough architect. In 1847 André took the Grand Prize, and went to Rome, but spent a considerable portion of his five-year studentship in Greece, where he prepared, as an *envoi*, a restoration of the Theseum at Athens, which attracted much attention. Returning to France, he was appointed clerk-of-the-works, under Labrouste, on the famous Bibliothèque Nationale, and later, under Rohault de Fleury, on the Museum of Natural History, of which he became, later, the architect. This group of buildings, which has, after nearly forty years, only just been completed, was André's principal executed work, nearly all his time, since 1855, having been spent in teaching. In that year Labrouste gave up the *atelier* which he had conducted so brilliantly, and André was persuaded by the pupils to take his place. This was one of the "*ateliers libres*," outside the School proper, although licensed to instruct pupils, and for a time it was hard work to maintain it. Labrouste himself was considered something of an architectural heretic, while his successor was an almost unknown clerk-of-works, and the *atelier* had to compete with the *prestige* of those of Lebas and Questel, and the authority of the official establishments. Slowly, however, it gained in reputation, and, after twelve years of outside work, André was chosen to succeed Paccard in the direction of one of the official *ateliers*. From that time the *Atelier André* was, perhaps, the most renowned and successful in the School. Even M. Rivoalen does not hesitate to repeat the stories current in the School — that André, besides teaching and encouraging his pupils with devoted enthusiasm, did not desert them until, in the *concours*, he had gained for them rewards and mentions by sheer force of the persuasive eloquence with which he advocated the merit of their work before his fellow jurymen; but he was not the first or the only professor in the School who thought that the geese who studied in his *atelier* were all swans, and tried to make every one else think so too; and if, as the students in the other *ateliers* thought, he overrated the genius of his pupils, he at least taught them, first, to study their plans with what M. Rivoalen calls "religious care," choosing always the simplest disposition; then, to complete the composition rationally and soberly, avoiding all sketchy indications and tricks of rendering, and inclining to largeness of parts, sensible and simple construction, and as much dignity and grandeur as possible.

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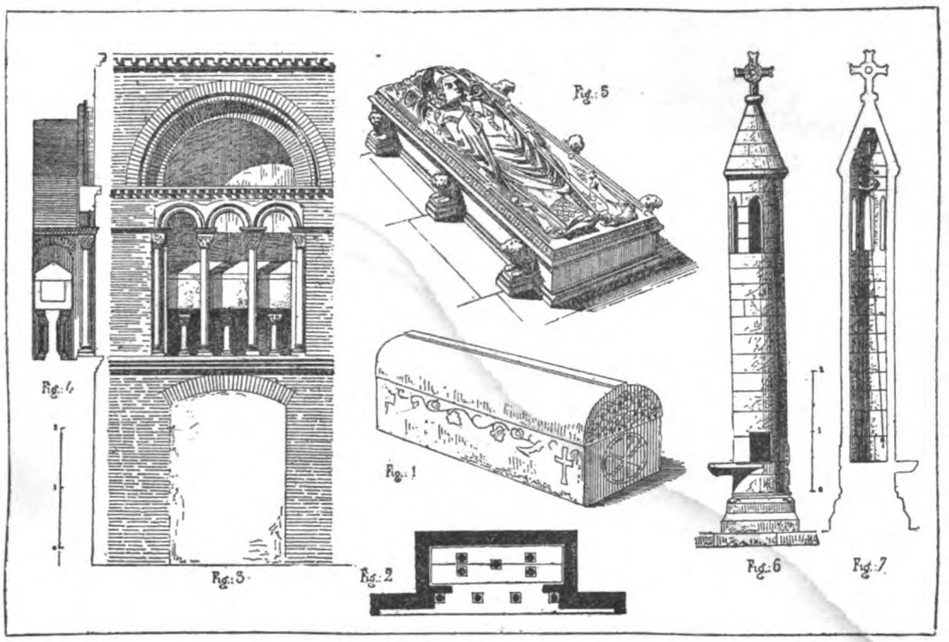
FUNERARY ARCHITECTURE.[1]—V.

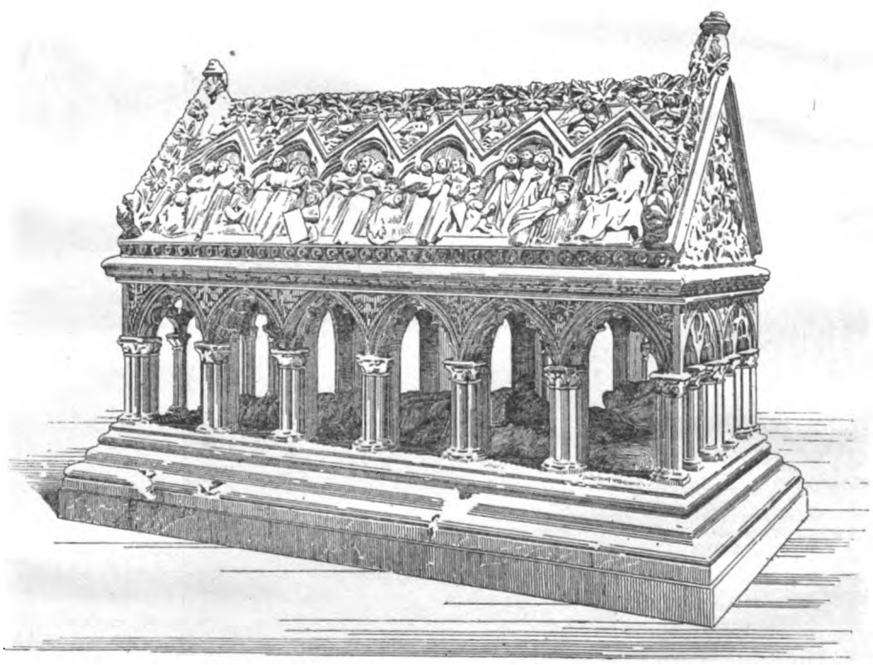
ROMANESQUE PERIOD AND THE MIDDLE AGES.

WE have remarked the chain of circumstances which led the primitive Christians to make the burial-place of their saints one with their gathering-place for worship. When it became possible for them to erect their temples out in the open air and in the sight of the world, as a natural consequence of tradition they constructed beneath the paving of the churches underground chambers, called "confessions." These were designed to take the place of certain parts of the catacombs, and here they continued to inter persons who died in the odor of sanctity. It was looked upon as an honor to be buried within a church or even under the eaves outside.



Specimens of Mediæval Tomb Architecture.

This period marks a notable change in sepulchral architecture. The tombs cease to be isolated structures, and become nothing more than tablets, or ædiculæ, raised in the interior of religious edifices. Requests for burial in the churches were, for obvious reasons, again and again combatted by the ecclesiastical authorities, and this sort of sepulture was confined to distinguished persons alone, or to prelates. But, owing to the benefits which accrued to the religious establishments from their laxness in this respect, we shall see that, in spite of all opposition, the custom was destined to prevail at length to such an extent that only the dead of the poor were relegated to the cemeteries. The latter, therefore, possessed no architectural features worthy of our attention; but, in the churches, countless tombs were erected, of such variety and interest that we find it difficult to indicate even the most characteristic examples without transcending the limits imposed upon us in this sketch.



Tomb of St. Stephen at Obazine.

"The tombs of the Middle Ages," says Viollet-le-Duc, "may be divided into three series: the first comprises the sarcophagi, properly so called, more or less decorated with sculptures, but with no representations of the dead. These are visible sarcophagi, placed above the ground. In the tombs of the second series the base sets over the burial-place; they sometimes bear the effigy of the dead, and are set either in a sort of niche or small chapel, or in canopied ædiculæ. The third series includes the flat tombstones laid on a level with the flooring of the churches — engraved or in bas-relief — and forming, as it were, the cover to the grave enclosing the coffin."

Great numbers of sarcophagi exist dating from the Merovingian and Carlovingian periods. The first often resembled very closely the Roman sarcophagi. Later on their forms were modified [Specimens of Mediæval Tomb Architecture, Figure 1], and in time they were transformed into cenotaphs reared above the veritable sepulchres, which were hidden from sight. When the tombs were not in the interior of the churches they were placed on the outside, between the buttresses, in niches made in the thickness of the walls, or constructed in front of the facing. Figures 2, 3, 4 give the plan and elevation of a tomb to be seen at Toulouse, in the ancient Church of the Chartreuse. This monument, dating from the twelfth century, is certainly one of the oldest of its kind. When it was built the sarcophagus still contained the body, a burial custom which the next century saw disappear.

Tombs of this sort exist in large number. The initial principle of their construction was always maintained, no matter what modifications were introduced into the details. They always comprise a niche with a more or less decorated vaulting, which is crowned with a gable, and shelters a sarcophagus. This disposition, which obtained, with different decorative forms, even during the Renaissance, was common in the inside as well as on the outside of churches.

Following the classification made by the learned architect quoted above, let us now glance at tombs bearing the images of the dead, and exhibiting them, not as in life, but as they were exposed on their funeral couches. The use of effigies of this kind apparently dates back to the twelfth century. Some of the sarcophagi, on which the figures were stretched, were set in niches ranging along the walls, and presenting the same features as those just described. Others, on the contrary, were placed either uncovered in the middle of

[1] From the French of Pierre Benouville in Planat's "*Encyclopédie de l'Architecture et la de Construction.*" Continued from No. 741, page 149.

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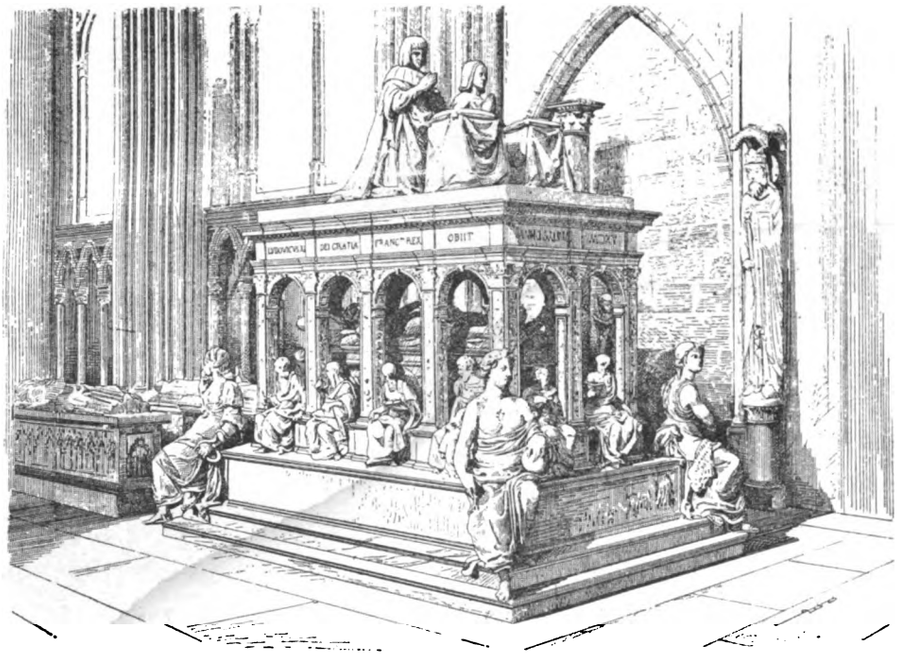
the naves and transepts, or under ædiculæ recalling in their forms the temporary catafalques which were erected above the uncovered tombs. These monuments were often very richly sculptured; the existing examples of them are as remarkable as they are numerous. Our illustration represents the Tomb of St. Stephen at Obazine (Corrèze). The saint lies under a canopy supported on open arches of very rich design; the bas-reliefs represent monks coming out of their tombs to prostrate themselves before the Virgin.



Tomb of Louis XII at St. Denis.

The third series of mediæval burial monuments includes all tombstones. The image of the dead is sometimes found on these in high relief, and sometimes in low relief, but oftenest it is simply engraven on a slab or stone of marble.

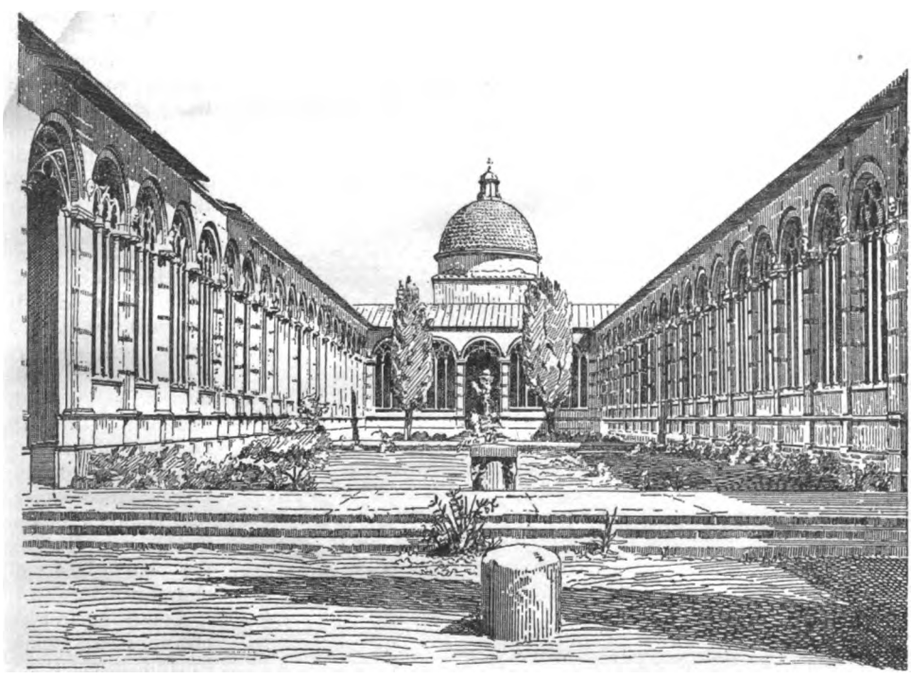
Effigies in high relief were generally raised on a low basement. They were quite often in metal, but, unfortunately, very few examples of these have been preserved. Figure 5 [Mediæval Tombs], copied from Viollet-le-Duc, shows the Tomb of the Bishop Évrard de Fouilloy, the founder of the Cathedral of Amiens. The recumbent statue of the prelate is of noble character, and the decorative details — the dragon on which his feet rest, the censer-bearers, and so on — are very well treated. There are six heraldic lions along the sides of the basement.

For certain ceremonies, cloth canopies, borne on metallic supports, were erected over tombs of this kind.

The place occupied by such monuments in the churches necessarily restricted their number. This, however, was not the case with flat, pavement tombstones, on which the figures were but slightly raised, or were merely engraven. As these did not interfere with free circulation about the edifice, they came into general use. A great many of them still exist, and are of beautiful type, being invaluable for the study of the history of costumes.

In passing, we will call attention to a curious sepulchral vault which can be seen in the chapel of the priory of Granges (Lot-et-Garonne), which is, we believe, unique. It opens on a level with the paving of the choir, and assumes the form of a human *silhouette;* it is about eight feet deep. A foot and a half downward from the choir-floor there are two stone cross-bars; a body was laid on these, and, when decomposition had completed its work, the remains fell of their own weight to the bottom of the vault, thus making way for another corpse.

The cemeteries, where mortals too poor to force an entrance into the churches were buried, were not always destitute of architectural character. Sometimes they were surrounded by porticos. They generally contained a chapel, and almost always a curious structure, known as a "Lantern of the Dead"



Campo Santo at Pisa.

Urn containing the Heart of Francis I.

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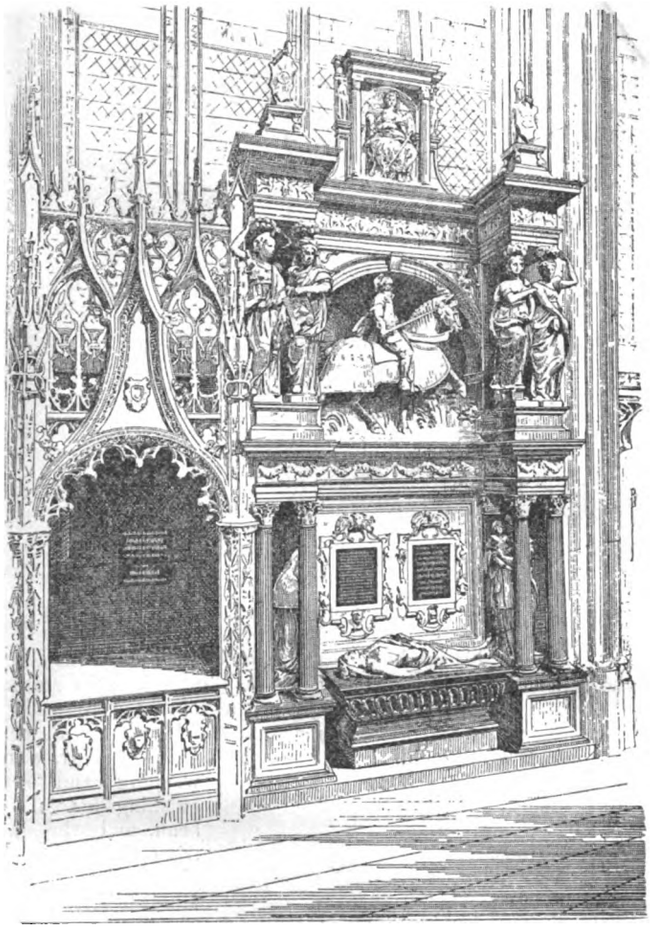
(Figures 6, 7). This was also a hollow pillar, with a receptacle near the top for the lamp, or beacon-light, which proclaimed afar the field of repose. Our figures represent the lantern at Ciron.

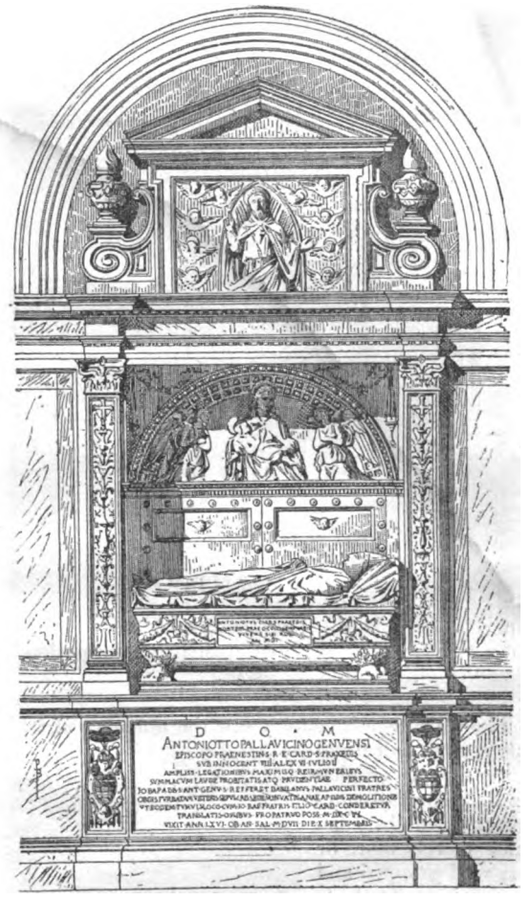
The mediæval tombs outside of France exhibit, with slight variations, notably in Italy, the same general dispositions described above. Scarcely any peculiarities are to be remarked in them except such as appear in other lines of contemporary architecture. We should, however, notice the use for sepulture, in Italian churches, of sarcophagi supported on consoles, and set at a relatively high elevation from the floor.

Although inhumation in religious edifices may have been as general elsewhere as in France, important tombs were less rare in the cemeteries of other countries.

The cemeteries themselves displayed more wealth. They were usually of mediocre extent, and were surrounded by beautiful porticos, beneath which the more pretentious monuments were erected. The Campo Santo of Pisa is the best known and the most remarkable of these cemeteries.



Tomb of Louis de Brézé in Rouen Cathedral. Jean Goujon, Sculptor.



Tomb in Santa Maria del Popolo, Rome.

THE RENAISSANCE.

During the Renaissance, in funerary constructions as in others, the new forms were merely applied to the general dispositions adopted in the Middle Ages. One innovation was, however, made. It is on tombs of this epoch that we first find statues representing the dead as living. They are usually shown as kneeling in the attitude of prayer. Images of the dead body were, nevertheless, not abandoned, and the two forms often appear on a tomb, one above the other. A notable example of this is seen in the Tomb of Louis XII at Saint Denis. A quadrangular basement, with allegorical representations at each corner, supports a sarcophagus, or rather, a funeral couch, on which are stretched the nude figures of Louis XII and Anne de Bretagne. This is surrounded by a series of graceful arches with highly ornate pilasters, under which small figures are seated. On the upper platform, the King and Queen appear kneeling before prayer-desks. A great many tombs are modelled after this one, which deserves notice rather on account of its architectural arrangement than for its sculptures. These are by no means all equally meritorious. Despite the somewhat theatrical character of the monument, no traces yet appear of those funerary emblems which are found on the tombs of later times. The same absence of special symbols is noticeable in the graceful urn in which the heart of Francis I was deposited. Nothing in the exterior indicates its use, except a funeral torch held by one of the infants seated on the lid, and close scrutiny is required to detect this. This urn is one of the finest specimens of Renaissance decorative sculpture.

In the cathedral at Rouen, facing the tomb of the cardinals of Amboise — where the uncle and nephew are represented in a kneeling posture under a profusely decorated canopy — stands the tomb of Louis de Brézé, grand seneschal of Normandy and husband of Diane de Poitiers. The recumbent lifeless figure of the deceased appears on a sarcophagus at the bottom of the monument, while above he is exhibited clad in armour and mounted on his mailed war-horse. The architectural proportions of the tomb are most graceful, and the sculptures are beautifully executed.

Certain general features of this tomb recall only remotely mediæval dispositions, and a gradual approach to those which had already prevailed for some time in Italy is discernible.

In Italy, likewise, the number of tombs in the churches was greatly multiplied at this period. So many of these exist in all the churches of the peninsula that one finds himself embarrassed in attempting to cite those of interest. Our illustration shows the character of a tomb at Santa Maria del Popolo in Rome. It is a familiar type of Italian tomb and is especially common in Venice.

In discussing the tombs of the Renaissance, attention should be called to the growing importance given to sculpture proper, which gradually relegated architectural decoration to a subordinate place. It was given to the genius of Michel Angelo to accentuate this tendency — a tendency of which he had no reason to complain, since it furnished him the opportunity for

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the production of such masterpieces as the tombs of the Medicis, his "Moses" and his "Slaves."

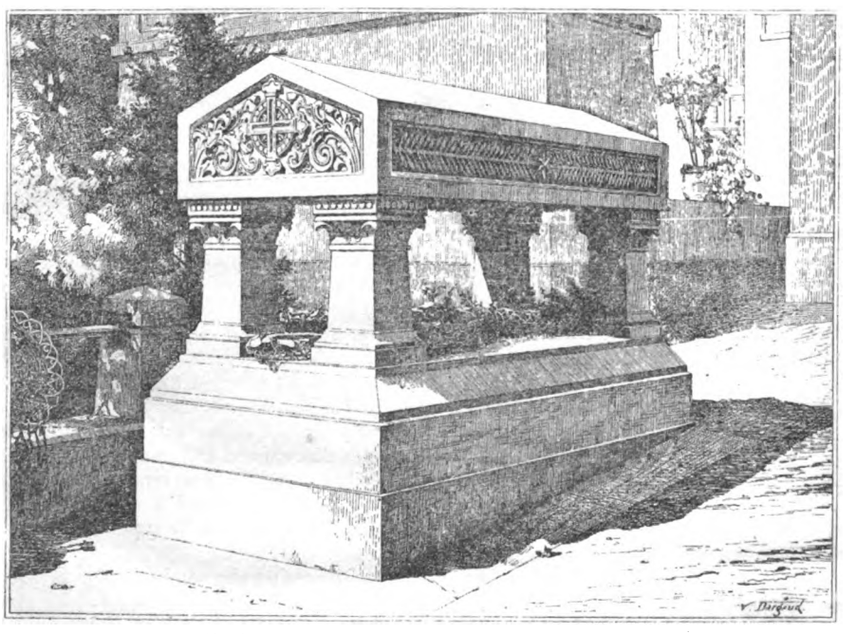
In the tombs of Michel Angelo, sculpture assuredly ranks first, but architecture holds a position of importance, which we see it rapidly lose. The tomb of Paul III offers an early but a very marked example of this transformation.

Tomb of Paul III.

Tomb of Mazarin.

MODERN TIMES.

The seventeenth century saw the tendency of which we have just spoken more and more sharply emphasized. The most important tombs became merely more or less well grouped and harmonious sculptures; all decorative and architectural forms were, so to speak, banished. In proof of this we reproduce the tomb of Mazarin. A more pronouncedly theatrical character exhibited itself in sepulchral structures, and the chief effect sought was to strike the imagination, rudely enough it is true, by a multiplication of symbols, cross-bones and skulls, grinning skeletons and reversed torches: the use of such emblems in bronze, and the contrasting black-and-white marbles contributed toward the same results; in order that all impression of grandeur should not be lost, the serene tranquillity of the sepulchral art of preceding centuries was necessarily sacrificed. This movement reached its zenith in the eighteenth century. The tomb of Maréchal de Saxe is one of its most remarkable productions. It stands in the ancient church of Saint Thomas at Strasbourg, and is the work of the statuary Pigalle. Death is represented at the foot of a pyramid of black marble opening a sarcophagus; the Marshal is descending into it with a calm air between the Genius of War, who is weeping and extinguishing his flambeau, and the Austrian Eagle, the Belgian Lion and the English Leopard, all of which are wounded or over-borne. France is endeavoring to hold back the hero with one hand, while with the other she repulses Death; leaning against the opposite side of the tomb is Hercules, overwhelmed with grief. The sculptures are, indeed, very beautiful, and there is an ampleness in the character of the whole which recalls the style of Rubens — a style, however, better suited to painting than sculpture. We confess that this sort of marble logogriph, with its multitudinous allegories, no matter how ingenious, does not satisfy us. How



Tomb at Montmorency. M. Lucien Magne, Architect.

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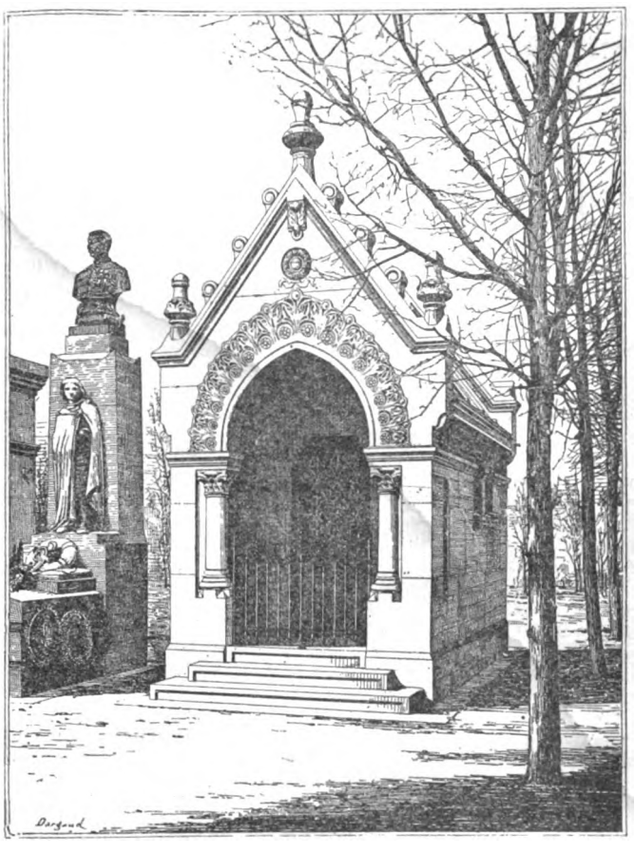
much nobler is the aspect of those burial monuments in which architecture wields the balancing power, tracing the main lines and leaving to the imagination of the sculptor only a field bounded by the rules of reason and taste!

During these two centuries the *vulgum pecus* continued to be buried near the churches, in cemeteries which were absolutely characterless. The people of the middle class, who were interred inside the churches but were unable to have marble or bronze monuments, marked their burial-places, as in mediæval times, by simple paving-slabs bearing inscriptions, with coats-of-arms or modest symbols cut into them.

We see evidence of a struggle after theatrical effects in the

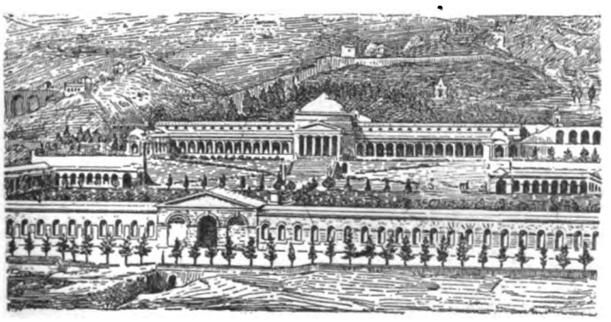
Tomb of the Maréchal de Saxe. J. B. Pigalle, Sculptor.



Sepulchral Chapel at Paris. M. Emile Vaudremer, Architect.

Italian tombs executed by Canova and his pupils at the beginning of the present century. Although manifestly engrossed with ancient art, the sculptors of this period were too much under the influence of eighteenth-century art not to strive after its effects.

In France the reaction declared itself less gradually: under



Campo Santo at Genoa.

the empire of the new ideas and of a legislation which proscribed burial in the churches, a kind of sepulchral architecture sprang up in which profusion made way for an affected simplicity and the adoption of heroic emblems — urns, broken columns, reversed flambeaux, hour-glasses, and wings of Time played the most important rôle among these. The Paris cemeteries, which all date from the beginning of the present century, abound in such monuments: with a few honorable exceptions, they seem to us now quite inappropriate and somewhat pretentious. They were followed by others whose designs were inspired by the study of Etruscan and Greek architecture. It would be puerile to depreciate the talent often displayed in these productions; but, alas, like all those of our time they are devoid of style proper, and are merely more or less happy adaptations of anterior styles. We must admit that the requirements made of an architect are difficult to fulfil. Cemetery lots are costly; and many an individual whose fortune permits him to acquire only the minimum plot of ground, 3 feet by 6, none the less demands that a sepulchral chapel be erected on it that will satisfy his sumptuous tastes cheaply. The unfortunate architect, struggling with the difficulties of such a problem, will be excused for finding in it no incentive to original work, and for doing scarcely better than the marble-dealers who make a specialty of putting up such monuments.

On the other hand, it is not rare to find on the same limited space a tomb, consisting of a simple tombstone or a stela, which reveals in its author a purity of taste and a science of arrangement not incompatible with the exercise of imagination. We give here a charming example, well worthy of imitation, which was designed by M. Lucien Magne.

As for chapels, there are some very beautiful specimens, but these are generally structures built on a sufficiently large scale to allow the architect a great deal of latitude. The one shown in our illustration is from the hand of M. Vaudremer; it proves that the strictures expressed above are, by no means, universally applicable.

Among the cemeteries of Paris, Père Lachaise enjoys a special reputation for picturesqueness: this does not seem to us indisputable, and in any case it is of little importance. We openly declare our preference for cemeteries like the *campi santi* of Italy; these broad fields, framed-in by porticos, and cut by symmetrical avenues bordered by monuments, possess a grandeur and an aspect of calm which we seek in vain in the picturesque pell-mell of Paris cemeteries. The Campo Santo laid out a few years ago at Genoa, whatever criticisms may justly be made regarding its size and the pretentiousness of

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certain of its monuments, appears to us to fulfil admirably well all requirements.

In Spain the cemetery is a sort of columbarium, open above, with cells in the walls very like the *loculi* of the catacombs.

Having rapidly reviewed the sepulchral architecture of the various civilizations, from the most primitive down to the most recent, we reach the conclusion that if an architecture peculiar to tombs has existed from all time, the distinction has always applied to general forms alone; these proceed, as we have seen, from a few primordial types. The details, the profiles, in a word, the characteristic elements of the style, have, in all cases, very nearly coincided with those adopted at corresponding epochs for religious or civil edifices. Perhaps the revival of the ancient practice of incineration may demand of architects in the near future, the creation of new forms to satisfy the seemingly innate need of the living to worship the dead.

Pierre Benouville.

HISTORY OF HABITATION.[1] — II.

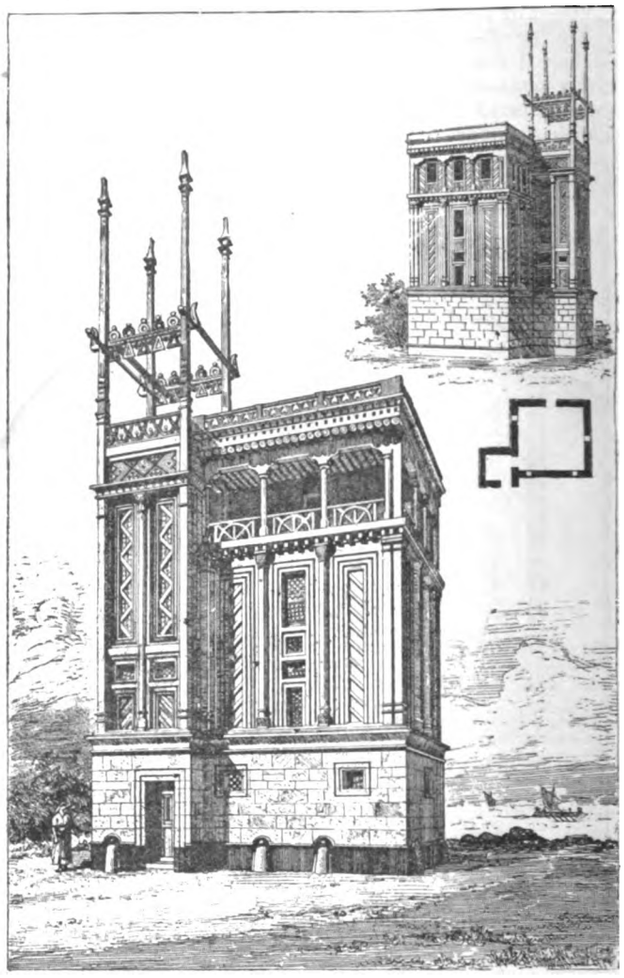
NOW let us consider the race of Japhet, which interests us more, not only because we ourselves are of the same race, but also because it is that which has had the longest career and of which the efforts are not yet exhausted. In the farther part of Asia, between the Caspian Sea and the Himalayas, our race had its cradle. Little by little, impelled by the sentiment of its own exuberance, this race undertook, more than three thousand years ago, a migratory movement which has not yet ceased, and which, from the banks of the Ganges, has led it as far as the Atlantic.

The history of the Aryan habitation is consequently connected with the Asiatic peoples as well as with the European. This series began, then, with a very curious Hindoo house, dated apparently from several centuries before Christ, and heavy in its general structure; while the Persian house, which stood close beside it, was remarkable for its elegance and complexity. It was composed of two parts, one of which, reserved to the females of the family, had only narrow windows, while the other part, intended for the men, was pierced with broad openings and offered easy access. We know that it was the Aryans who introduced the employment of the curved line in architecture, and it is in the Asiatic dwellings that is remarked its first appearance. This point is very important for the history of architecture, and will serve to destroy many errors and prejudices, among others that which accords the honor of having invented the arch to the Romans, and the merit of having created the pointed arch to the Goths. I saw, for instance, at the entrance of the Persian house a pointed arch, which proves that in the time of Cyrus the architects did not exclusively limit themselves to the right line, and that if later the Greeks banished from their designs all rounded forms, it was not through ignorance of the advantages and attractions that these forms might present, but because they limited themselves voluntarily to an artistic idea which would have things thus.

It is, besides, impossible to suppose that the reproduction of the Persian house, which inspired within me these reflections, leaves anything to be desired from the point-of-view of historic exactitude, for it was built after documents furnished by M. Dieulafoy, the celebrated French explorer of Suza.

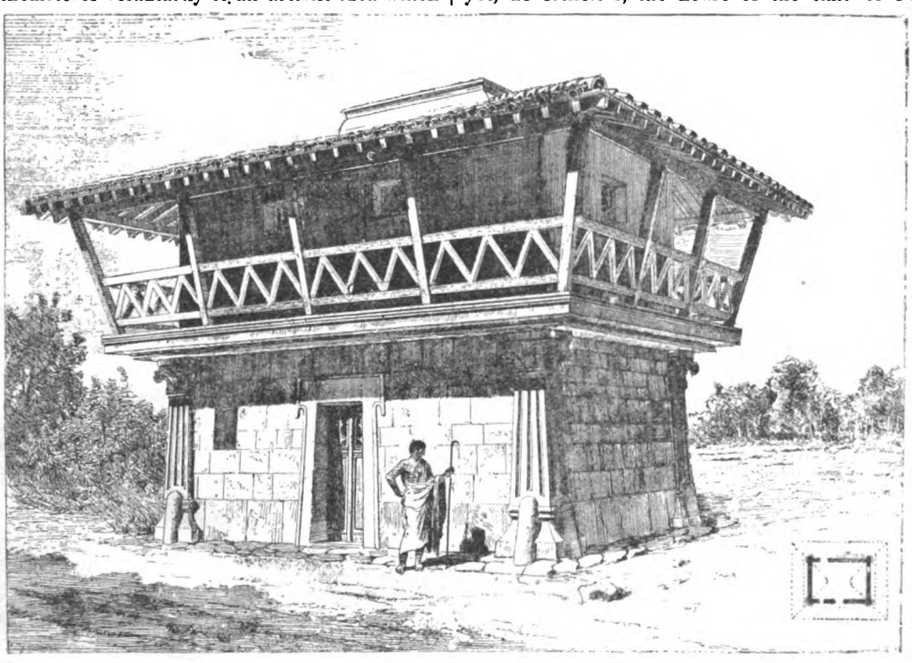
On passing to the compartment devoted to the Aryans of Europe, the progress accomplished by this predestined people, who served as the vanguard of civilization, can be studied step by step. If the Gallic and Germanic villages, composed of huts built of straw, of wood, or of roughly-hewn stone and covered with mud, indicated a state of grossness very inferior to the degree of refinement at which had arrived the Persians of the time of Cyrus, the habitations of the Greeks and Romans, who were the elect among the Occidentals, revealed to us all the perfections of a wise and gracious art.

The epoch at which the Greeks took the place of the Pelasgians



Phoenician House: from the *Moniteur des Architectes.*

in the country of Hellas dates back a thousand years before our era, yet, nevertheless, the house of the time of Pericles is enough to show us that in a span of time relatively short, and despite the fulness of the political cycles and the furor of factions, this people knew how to give its artistic genius the most ample development. One was very much impressed by the truthful character which declared itself in this structure, upon the walls of which was read, according to a custom very common at Athens, inscriptions of this style: "In this house dwells Heracles. Let nothing bad enter in."



Etruscan House: from the *Moniteur des Architectes.*

The Romans supplanted the Etruscans in Italy, as the Greeks supplanted the Pelasgians in Hellas. The Roman wall is, like the Athenian, covered with inscriptions, and in these there is no difference except in the language employed, for they always relate to the proprietors of the building and express aspirations for his well-being, for the prosperity of the family and words of welcome for the guests; and here and there bits of wit or

[1] Continued from No. 741, page 151.

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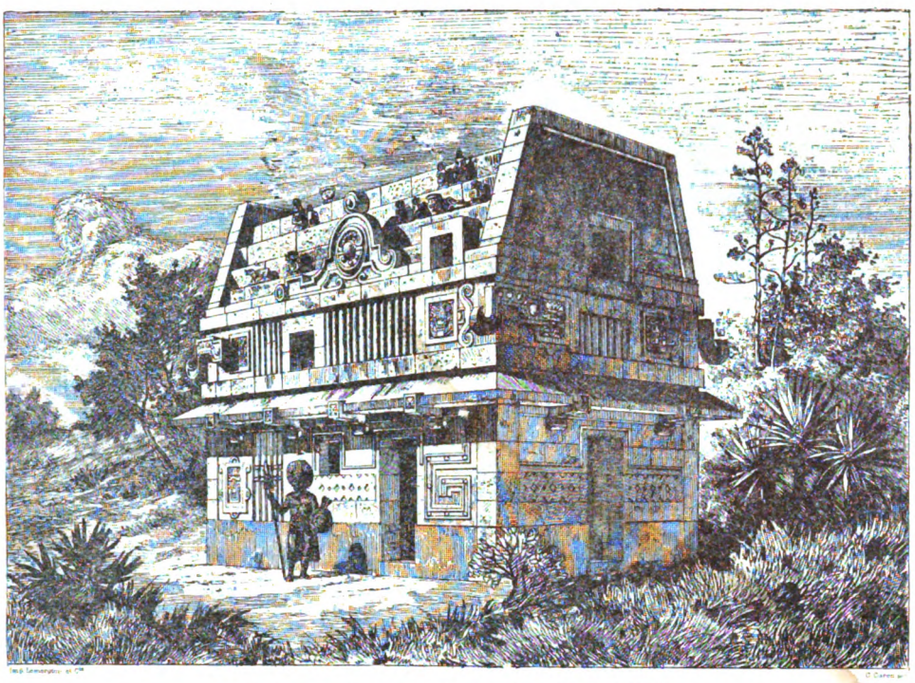
philosophical maxims. Nevertheless, I have a bone to pick with M. Garnier for having chosen his type of a Roman house at Pompeii, which was rather a town of an international character, a place really where Roman society encountered Greek society, and where consequently the tastes became assimilated and mixed. That which is called in the Pompeiian style of decoration is neither Greek nor Roman, for the reason that it is both at the same time, and as much can be said for the architecture which prevailed in that city of the dead which archæology is disinterring little by little from its ashes.

After the Athenians and the Romans, there was, as it were, an eclipse, which endured for several centuries, and M. Garnier had the pleasing idea of making us sensible of this period of barbarism by a war-chariot of the Huns, which gave a very fair image of the savage hordes who formed, as it were, the rear guard of the race of Japhet, and who suddenly seized civilization by the throat, and with their brutal feet trampled upon all beautiful things which human genius had up to that time created. Then in its turn came the Gallo-Roman house, a dwelling of the Romanesque style, which represented a state of transition, and formed the bridge which connected the old Greco-Roman world with the Renaissance, represented by a pretty little house of a very agreeable appearance, where cut stone and brick were allied with wood, and which was relieved at one of its angles with a projecting *tourelle*. This house finished the series of the Aryan people.

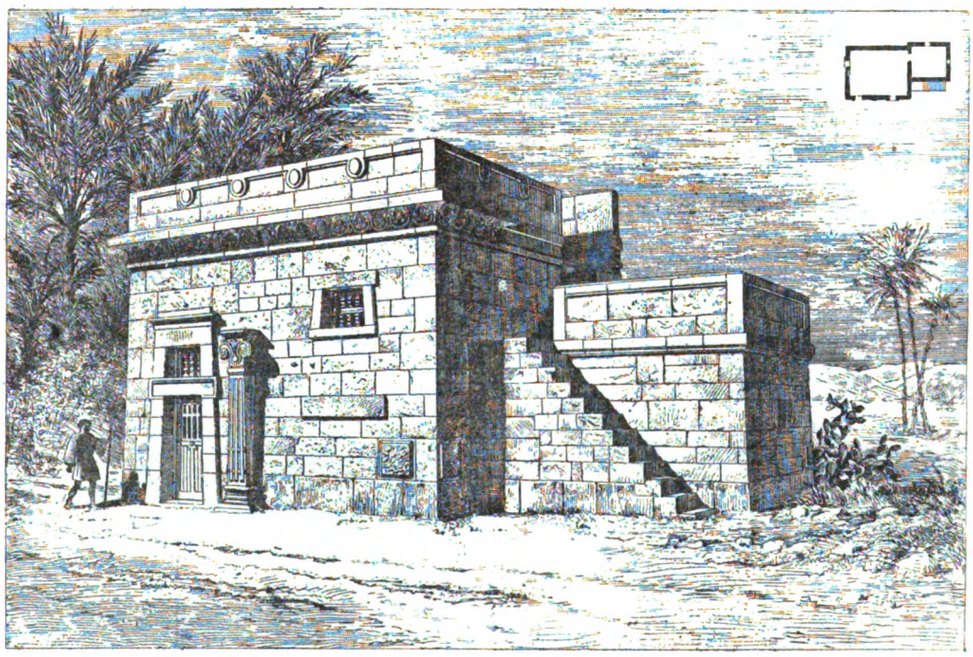


An Aztec Dwelling: from the *Moniteur des Architectes.*

The last series was devoted to those nations or savage tribes, who, through different reasons have remained in a state of barbarism, like the Esquimaux or the negroes, or have established themselves in an immovable manner of civilization like the Chinese and Japanese: these without being devoid of interest, had less attraction for us. Here one looked very curiously at an encampment of American redskins at the time of the discovery of the New World, a habitation of the Aztecs, a dwelling of the Incas, those sons of the sun, whose mysterious genius was so inopportunely arrested in its upward course through the conquests of Pizarro.

By a singular chance of topographical disposition, the Renaissance house, which was the terminal point of the Aryan section, was placed just at the foot of the Eiffel Tower, which reared itself there like a colossal exclamation-point, and formed at the same time the crowning, last expression of this review of human habitations, where, in an almost inextricable mingling of types and epochs, one could disentangle the different successive steps characterized by the substitution of wood for straw, and in the last place of iron for stone in architectural construction.

In spite of the lively admiration which this work of M. Garnier inspired within me, I am forced to say that in many points it seems to lack truth and exactitude; but I hasten to add that in that which especially concerns the dwellings belonging to historical epochs, the objections with which the critics assailed him were unjust and exaggerated. It is always difficult for a scholar to reconstitute, after vague descriptions, a monument of any kind, all vestiges of which have entirely disappeared. All the more it must be extremely difficult, if not impossible, to faithfully reproduce buildings which belong to far-distant times, for the simple reason that the dwelling-house is the first to disappear in great catastrophes. In the records of the writers who survive these catastrophes indications of public monuments may be found, but nothing about private habitations. What happened in the case of the Temple of Jerusalem is an example for us of the facility with which one can be led into errors in these matters. Certain modern historians have described it for us as a vast and majestic enclosure, composed of three walls surmounted with colossal towers; but lately has appeared M. Renan, who has taught us that the famous Temple of Solomon was, at the most, of the size of our Nôtre Dame de Lorette.



Hebrew House: from the *Moniteur des Architectes.*

This has not prevented the Aristarchuses, who like to hunt for the hair in the egg, from seeking a quarrel with M. Garnier apropos of the least detail. They do not excuse him the least lapse; they have cast in his face the slightest inexactitudes; they have cried out to him that his huts were like extinguishers, that the Hindoo house does not exist as a single type, because India is a purely geographical expression which includes a hundred nations, who have customs, languages and tastes opposed and differing one with the other. They have charged it as a crime that he has attributed to the Assyrian house an ornamental symbol, the globe with its great out-spread wings, which belongs rather to the Egyptians of the time of the Pharaohs, and for having painted the Japanese house, a thing which, as it appears, is contrary to the ordinary customs of the inhabitants of Yeddo and Yokohama. After this, what? Do they mean, by chance, to pretend that in carrying out an enterprise of this importance the French architect assumed infallibility? A man who would be able to reconstitute

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plastically the history of the human habitation from prehistoric age down to our days without making a blunder in any of his arrangements must know himself more things than can be contained in a hundred encyclopædic dictionaries, and possess more knowledge than the members of fifty academies can boast. If such a man as this existed, there should be erected in his honor altars, and statues of gold should be created for him, for he would be, through his genius and erudition, nearer god-hood than any man who has ever lived.

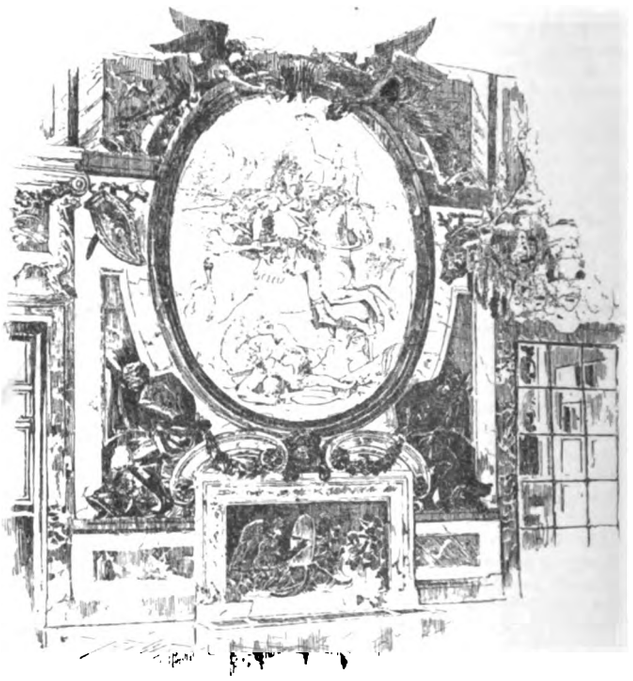
For my part, I feel that the only real mistake which M. Garnier can be reproached with having committed, as I said at the outset, is for having taken as the base of his exhibition the ethnographic standpoint, and so having made a sketch of the history of domestic morals and family customs rather than a history of architecture. It is to be hoped that some one else will rectify his error. There is talk of a great universal exhibition which shall take place shortly in the United States, where we are assured that the spirit of emulation will cause to be erected a colossal tower, in comparison with which the Eiffel Tower will be only a modest village spire. Why, have you not on the other side of the Atlantic a *savant* or corps of *savants* who will take up anew the idea of M. Charles Garnier, and rehabilitate the history of human habitation, taking for an objective point the creation of a correct history of architecture? H. Mereu.

EQUESTRIAN MONUMENTS.[1] — XXIV.

LOUIS XIV.

Louis, Carnot and Boulanger — a Parable. From *la Vie Parisienne.*

THE political sagacity of Richelieu, which enabled him by the use of money to thwart the attempts at Spanish aggrandizement, at the same time created comparative quiet in which to crush the spreading interest in Protestantism in France, and to develop to the utmost the resources of the kingdom. This he was able to do on a well-considered scheme, since the somewhat incapable Louis XIII left matters of administration absolutely in his prime-minister's hands. In taking part in the Thirty Years' War by subsidizing the Swedes, Richelieu laid the foundation for a long and stormy period during which the French found themselves forced to take a part in matters which strictly pertained rather to the interests of central Europe. Richelieu was succeeded as prime-minister by Cardinal Mazarin, who during the minority of Louis XIV was practically the master of the destinies of the kingdom, as he had unlimited control over the regent Marie de' Medici. He was by no means so successful a statesman as his predecessor, while as an individual he excited the strongest dislike on the part of many of the powerful nobles who at length formed themselves into an organized opposition, and in derision were called by Mazarin and his supporters the "Frondeurs"; but ridicule under such circumstances is not a very useful weapon, and Mazarin found himself driven from the kingdom and forced to take refuge in Holland. The internal troubles excited by the Frondeurs at length acquired considerable importance and assumed a most vivacious aspect, and, as we know already, in the armed struggles which followed the famous Condé and the almost equally famous Turenne, once companions-in-arms, were at length arrayed against each other as besieger and defender of Paris. Louis XIV at length came to the end of his short minority, ascending the throne at the age of fourteen, and very shortly began to take a personal control of matters. The consequence of this was the cessation of internal troubles, a cessation largely brought about by his address in winning back to their allegiance the discontented nobles of the Fronde; so that at length it became quite as much the fashion to support the king and his ministers as a short time before it had been fashionable to oppose in every way the representatives of the royal power.



Louis XIV, in the Salon de la Guerre, Versailles. Coysevox, Sculptor.

The Marcus Curtius, Versailles. Bernini and Girardon, Sculptors.

Louis XIV, in the Place Bellecour, Lyons. Lemot, Sculptor.

Louis had married the daughter of Philip IV of Spain, and on the death of his father-in-law he made pretensions in behalf of his wife to the Spanish possessions in the Low Countries. Pretensions of this kind could only be enforced against the hardy citizens of the Dutch Republic by force of arms, and the natural result was that France was brought into more direct personal relation with the great

[1] Continued from page 77, No. 736.

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struggle between Protestantism and Catholicism in Germany than had been the case during the Thirty Years' War. The Dutch naturally sought allies amongst other Protestant countries, and a triple alliance was made between Holland, England and Sweden. The appearance of an English interest at this time was particularly disagreeable to Louis, for he had, during the preceding twenty years, built up a navy of considerable importance, and on its assistance he largely relied for a successful issue in his attempt on the Netherlands; but he knew that it would be hopeless for him to cope single-handed with the two great naval powers of the time, the Dutch and the English. Fortunately for him the light-minded Charles II was at that moment king of England, and taking advantage of his impecuniosity Louis, with the aid of certain ladies of his court, one of whom subsequently became the noted Duchess of Portsmouth, managed to detach the English from the triple alliance by making Charles his paid pensioner. The Dutch, thus deserted by the Protestant islanders, were unable to hold their own against Louis, who, in 1672, invaded Holland with 100,000 men under Turenne. The outlook was so apparently hopeless that the Dutch sued for peace: but the conditions which Louis sought to impose, namely, an indemnity of twenty million French pounds, a certain portion of the Dutch territory to be permanently incorporated in the French kingdom, but above all, the demand that the Catholic religion should be established absolutely throughout Holland, were so galling to the Dutchmen that they resolved on making one more effort. As in other instances where the Netherlands had been invaded and the inhabitants found themselves at bay, the dikes were unhesitatingly cut and large areas of the country were submerged, a step which not only put a check at those points to anything like warlike operations, but absolutely destroyed for a considerable time the value of the territory coveted by the French king.

Louis XIV, in the Cour d'Honneur, Versailles, France. Petitot and Cortellier, Sculptors.

Amongst the other German allies whom the Dutch secured at this juncture was Frederick, Elector of Brandenburg, who in his early youth had taken a minor part in the closing years of the Thirty Years' War, and since that time had devoted his attention entirely to his plans for increasing the area, the wealth and the military capacity of his electorate, so successfully that at this time the Elector of Brandenburg was a person of considerable weight in any of the affairs which impinged on the welfare of central Europe. With the aid of the Elector of Brandenburg and William of Orange, who was elected stadtholder — William who was subsequently the third William of England, the Dutch managed to repulse the French. This unsuccessful attempt to absorb Holland gave Louis a fancy for extending his kingdom to the eastward, and he at once fixed his mind on the Rhine as the proper boundary for his realm, and throughout the remainder of his reign he never lost sight of this idea. It was, therefore, according as his efforts seemed to promise success or failure that the behavior of all the other powers of Europe was adjusted during the rest of his career.

Louis was unquestionably a great man, for he had the all-important attribute of a great mind, the capacity to perceive ability in others and a willingness to employ such abilities in the best way. It was this power of judging character that gave him Colbert, Louvois, Vauban, Condé, Turenne, Luxembourg and other almost equally famous men as executive assistants. The world is now somewhat given to laughing at the airs and graces which he assumed towards the close of his reign, to mock at his pompous belief in his own infallibility — which was only the natural outcome of many years of adulation on the part of interested courtiers — and to overlooking the real capacity of the individual, forgetting what was actually accomplished in his time. To commemorate, then, such a career as his, was for Art merely to perform its proper function.

Louis XIV, in the Promenade de Peyrou, Montpellier, France. Debay and Carbonneaux, Sculptors.

At an early stage of these papers some account was given of the several equestrian statues of Louis XIV, which were destroyed during the French Revolution, but besides those which passed away at that time there are others which still exist. The best known of these is the one which stands in the Cour d'Honneur, at Versailles, where Louis is represented in the cavalier costume of the period, and not as was usual with the earlier statues in a mixture of Classic robes and sandals with modern periwigs. This bronze statue was the work of the two sculptors, Cartellier and his pupil Petitot, the first of whom modelled the horse, while the king was modelled by the latter. It was at first intended that this statue should represent Louis XV and find a place in the Champs Elysées at Paris, but for some reason it was finally made to represent his more illustrious great-grandfather. The statue which is about 21′ 6″ high is a modern one, erected in 1832, but it is

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certainly not such a work of art as befits its situation. At Versailles there is also a very curious and interesting equestrian statue which now goes by the name of Marcus Curtius, and stands on the brink of what is known as the Pièce d'Eau des Suisses. In reality this statue, which is of marble, was commissioned by Louis XIV from the Italian sculptor Bernini, at a time when the king was smitten with a fancy for Italian art and artists and Bernini was getting towards his dotage. At any rate, when the statue, which is commonly believed to be the sculptor's last work, was at length received at Versailles and unpacked, the king was so thoroughly disgusted with the idea that Louis the Magnificent should be represented through the coming ages as a guy of that kind that he at once gave orders that the statue should be smashed to pieces. The sculptor Girardon, however, perceived a possibility of preserving a statue which to him seemed to have some elements of artistic worth, and he obtained permission to endeavor to make one of those transmogrifications of which we find frequent evidence in the history of different statues. The fact that the work was of marble made it possible to obliterate and change the marked and aquiline features of the great Louis and make certain minor changes, so that when the sculptor had finished his task, instead of Louis the Great ascending the Hill of Fame, the hill had been hewn into a representation of flames, and instead of Louis there was left Marcus Curtius about to plunge into the flaming gulf.

There is also, at Versailles, an interesting bas-relief of large size (about four metres high) and oval form, which forms the decoration above the mantel in the Salon de la Guerre. This bas-relief in stucco, by the sculptor Coysevox, shows Louis on horseback trampling upon his enemies, while Fame and Courage and Victory attend him. As all else in this hall is marble and gilded copper, it seems probable that the plaster-work was simply a temporary matter, and was intended to be replaced later by a copy in marble. The sculptor was paid only $270 for his work.

Besides these figures of Louis and the bas-relief by Coustou on the front of the Hôtel des Invalides and the statue on the façade of Strasbourg Cathedral, already mentioned, there also remain equestrian statues of Louis XIV at Montpellier and at Lyons, and although the work of different sculptors, there is a very marked similarity in the two groups. In both cases the rider is represented in Classic attire, and in both cases the horse is of that light build which horsemen speak of as a "Maybird," but they are both animated and rather interesting figures, and the one at Montpellier has the fortune to occupy one of the best positions for a statue in Europe.

The statue at Lyons by the sculptor Lemot was erected in 1825 by the order of Charles X who desired to banish as rapidly as possible the memory of the popular revolt that had caused the overthrow in 1792 of Desjardin's equestrian statues of Louis XIV which had stood upon the same spot. The statue at Montpellier, the work of the sculptors Debay and Carbonneaux, was erected four years later.

Better known than any of them, except possibly Cartellier and Petitot's statue, is the rearing bronze horse and its rider which stands in the Place des Victoires at Paris, an open space of such limited area that it is not possible to obtain a very favorable standpoint from which to view the statue. In 1792 there was standing upon the same site a pedestrian statue of Louis which was, of course, destroyed on that August day: it was by the sculptor Desjardin and had been set up by a single admirer, the Duc de la Feuillade. To heap the utmost scorn upon the relics and remembrances of royal rule there was, not long after the destruction of Desjardin's statue, built upon the same spot a large stone pyramid upon which were inscribed the names of Republican victories and it was the presence of this trophy that gave the place the name it still bears. In 1806 the pyramid was in its turn removed to give place to a pedestrian statue of General Desaix, and after the Restoration the effigy of the General served to furnish a portion of the metal needed for the fashioning of the equestrian statue of Henri IV on the Pont Neuf, which was cast in 1817. In 1822 the present statue, the work of the sculptor Bosio was erected, as we are told by the very simple and pleasing inscriptions, at the order of Louis XVIII: the inscription upon one face of the pedestal is simply

LUDOVICO MAGNO,

and upon the opposite side

LUDOVICUS XVIII ATAVO SUO.

It is impossible to regard this pseudo-classic group with as much disfavor as one theoretically would like to entertain for it. The seat of the rider is particularly good and the group as a whole has a sterling sculpturesque value which the groups at Montpellier and at Lyons do not share with it.

In a time when all of the greatness and magnificence was absorbed by the king, there was small chance that any of the other great men or the day would find artists to immortalize them, and the fame of the contemporaries of Louis XIV rests rather on the testimony of the historian than on such proof of greatness as a multiplicity of paintings or statues might otherwise effect.

Of Louis XV no equestrian portrait remains, and of Louis XVI none ever existed. To find equestrian statues representative of the next chronological period France must be abandoned, and attention turned to France's great present rival.

Louis XIV. — ("*Le Grand Monarque*"; "*Le Roi Soleil*"; "The Destroyer of Heresy"; "*Louis le Grand.*") Son of Louis XIII and Anne of Austria. Born September 16, 1638. Ascended the throne in his fifth year under the regency of his mother, who was directed by Cardinal Mazarin. At the latter's death (1661) governed alone. Married (1660) Maria Theresa. Invaded Flanders and Franche-Comté, 1667; revoked the Edict of Nantes, 1685; opposed the Spanish and English in 1688, and in the War of the Spanish Succession, 1700. Died August 31, 1715, after the longest and most brilliant reign in French annals. Ministers: Mazarin, Louvois and Colbert. Generals: Turenne, Condé and Luxembourg. Writers: Corneille, Racine, Boileau, Molière, La Fontaine, Bossuet and Fenelon. Artists: Le Brun, Mignard, Rigaud, Coysevox and Puget.

Petitot. — Louis Messidor Lebon Petitot, son of the sculptor Pierre Petitot, born at Paris 1794, died 1862. Pupil of his father and Cartellier. Grand Prize 1814. Among his numerous works are "Jeune Chasseur blessé par un serpent," now in the Luxembourg, a statue of Louis XIV at Caen, bas-reliefs in the Louvre and Chamber of Deputies; four allegorical figures on the Pont du Carrousel and a colossal monument at Napoléon St. Leu in memory of Louis Bonaparte, King of Holland.

Cartellier. — Pierre Cartellier. Born at Paris 1757. Died 1831. Pupil of Bridan. His principal works are upon the Louvre and Luxembourg palaces, and statues of Generals Valhubert and Pichegru, the Empress Josephine, Minerva, Modesty and (with Dupaty) the tomb of the Duc de Berri.

Bernini. — Giovanni Lorenzo Bernini, born at Naples, 1598. He was gifted with brilliant talents which he early manifested, and was taken to Rome when very young. He made busts of the Pope and various cardinals, and at eighteen had executed his marble group of "Apollo and Daphne," now in the Villa Borghese. He worked, under different Popes, for fifty years. His principal works in sculpture are the bronze equestrian statue of Constantine the Great in the portico of St. Peter's, the monuments of Urban VIII and Alexander VII in the same church, the great canopy over the high altar and the chair, supported by colossal statues of the Four Doctors of the church of St. Peter, both in St. Peter's, the "Ecstasy of St. Teresa" and the "Rape of Proserpine." He also designed the fountains in the Piazzas of Navona and Barberini, and numberless statues and sculptures. He was much employed as an architect and executed the double colonnade in front of St. Peter's, the chapel of S. Teresa, and the church of S. Bibiana, and finished the Barberini Palace, begun by Maderna. He was very prolific and possessed great talent, but was too much inclined to fall into exaggeration in his striving for effect. His style became the fashion in Italy, and was almost universally copied with bad results. His influence on sculpture was most unfortunate. He died in 1680, leaving an immense fortune, and was buried in Santa Maria Maggiore.

Debay. — Jean Baptiste Joseph Debay (the elder); born at Mechlin, Belgium, in 1779; died at Paris, in 1863. Pupil of Chaudet. He made numerous ideal and portrait statues, decorative sculptures and portrait busts.

Coysevox. — Charles Antoine Coysevox, one of the ablest sculptors of the French school. Born at Lyons in 1640. Before he was seventeen he made a statue of the Virgin, which created much attention. He then went to Paris and studied under Louis Lerambert. Author of many works at Versailles, including the equestrian relief of Louis XIV on the chimney-piece of the Salon de la Guerre. His other works are the two equestrian statues of Fame and Mercury in the Tuileries Gardens; several figures of Saints and the Virtues in the Church of the Invalides; a pedestrian statue of Louis XIV for the Hôtel de Ville; a statue of the Duchess of Burgundy as Diana; one of Maria Theresa; one of the great Condé at Chantilly; the tomb of Mazarin in the Louvre; that of Colbert in St. Eustache; Le Brun in St. Nicholas du Chardonnet, and the statue for the tomb of the Marshal de Créqui in St. Roch. Probably his busts are his finest works. Among them are those of Marie Serre, Mignard, Le Brun, Bossuet and Richelieu in the Louvre, and Colbert, Vauban, Mansart, Fenelon, Mazarin, Turenne, Marshal Villars, Girardon, Louvois and Edelinck. "Enfin on peut dire qu'il à eté le Van Dyck de la sculpture." Coysevox avoided to a great extent the affectation so common in works of his period.

[To be continued.]

TEOTIHUACAN — "THE CITY OF THE GODS" — MEXICO.

QUINTUS CHURCH - MAINZ.

TO inquiring minds, there is a strange, undefined attraction, in the remains of a dead civilization, especially if pre-historic, or with a history written in characters which no one can decipher. Such a history has Teotihuacan — a city of ruins, of crumbling tombs, broken idols, and silence, dominated by two stupendous truncated, terraced pyramids — built to commemorate that which we would so much like to know. The Toltecs or Nahuans the builders of the Mississippi mounds, are said to have built these, and many other pyramids in Mexico, in their migrating epoch, more than a thousand years ago. The best authorities give very poor accounts of these grand ruins — maiming poor Truth so hopelessly that they make of her another ruin. Of course, the writer is not foolhardy enough to correct the work of his betters, for, even in our times, he who would grasp the sword of Truth, must take it by the hilt of authority, or it will very likely hurt him. It is a pity, that the traveller's exploring spirit and the book-making faculty are not more often found in the same person; for it must be an arduous undertaking to make a book of travels from a library, for it can be, at best, but a palatable literary hash, as like, or unlike the real thing, as a geologist's pictured landscape of the time when the coal measures were being formed.

The two great pyramids (for there are many others) are called the "Sun" and the "Moon." The Sun is about 750 feet square and 200 high: The Moon is somewhat smaller. It seems as if both were built from the level ground, although this has not been proved. The "Sun" contains about eight million tons of material which was brought from a distance, for other pyramids. Immense embankments and the dwelling places lie close around the "Sun" and the "Moon."

At times, building was stopped; for at various heights the structure was floored over with a layer of concrete made of broken pumice and clay. The "Moon," when finished, was entirely covered with similar concrete: slopes, and terraces, top and "patios" or yards surrounding it. It stands facing a long, wide, straight street, which is defined on each side by immense embankments which were crowned

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their whole length by rows of pyramids. There were steps to go from the street up the embankments, and each pyramid of the scores that stood in line had steps on its four sides, and probably a flat top. These steps were probably lined, row above row, for a mile in length, by seated spectators, on occasions of sacrificial ceremonies, processions, games, etc. It is impressive to imagine what immense faith, patience and energy went to the building of cities like this, and others much finer, which are found farther south. What splendid organization, grand communion of effort, peace and plenty! Modern times are better, of course, though "work" must have been easy to find then, work and food. They are both scarce now in most countries, perhaps because the builder no longer builds useless pyramids, but beautiful palaces and tenement houses. Plastered walls, covered drains, and concrete floors have been for ages useless object-lessons to the dwellers on the ruins, degenerate descendents of their great builders, but, since the priest, soldier and other tax-collectors have had them in hand, they no longer seem to be able to do what they once did; even churches they no longer build, nor repair those they have. Probably they would relapse into free-and-easy barbarism, were it not for the educative effect of the taxes they pay to buy ships of war, etc., to defend them; and of the fees that the priest collects on baptism, marriage and death; at the rate of one dollar for the heavenly fellowship, and fourteen for earthly bliss, while for the peace of the grave that passeth all understanding they may make the best bargain they can.

Where in the whole world can a climate be found more perfect than that which eternally blesses the valley of Mexico — it is that which all ages have sung praises of: pleasant in the sun, delightful in the shade; like a beautiful woman, a grand opera, or the embodied dream of a painter, of which one never tires: it will serve as a standard by which to judge its kind. It is worth a journey the length of a continent, or the breadth of an ocean, to view the wondrously impressive landscape from the top of the "Sun." Majestic dissolving views of sunshine and shade follow each other in solemn procession, round the circle of the enclosing mountain ranges: brilliantly light and airy in the dazzlingly strong sunshine; softly blue and hazy in the great valleys; while, in the deep shadows, the clear-cut Plutonic profiles in stern array stand outlined, roughly impressive, like gigantic idols — "*à la* Toltec." Trooping masses of fleecy clouds sweep majestically over the valley, to linger caressingly about the twin volcanoes, whose snow-crowned summits peep occasionally through a rift as silvery white as their floating visitors. Ever-green woods clothe the lower slopes of the hills, and creep down into the shimmering plains, and run along in sinuous lines, fringing the water-courses, down into the cultivated valleys, on towards the great lakes which cluster in sheeny splendor in the centre of the glorious picture.

Radiating from the pyramids, undulating over the mounds — tombs of the past, if of nothing else — run the furrows of the *Inditos'* changeless plough, the prototype of which — before the Pharaohs were — scratched into fertility the banks of the Nile. Scattered over the buried city are lush fields of "alfalfa," patches of bearded barley in their golden prime, "chile colorado" that blazons its presence as if it were a spread mantle of glowing flame, and, thriving where harvest has followed harvest for a thousand years, waves the familiar tassel of the cosmopolitan corn; the whole bordered by the sturdy "maguey" in ordered array, with bayonets fixed. A thing of beauty and a joy forever to the "pulque" drinker, is a maiden maguey. Its immense, turgid limbs — clothed in a light purple bloom, as full of juice as a luscious peach — curve boldly outwards, spear-pointed, in defence of its tender, sensitive heart. In vain. In its seventh year it is made to yield thrice daily, its vital ichor during four or five months, until its bloom and strength are sapped; then it wilts and shrivels into a tangled bunch of bleached fibres, from which springs the brood of a new generation. When not tapped it flowers splendidly — when it feels like it — once before it dies.

"Pulque" is the hourly drink of the *Inditos* of Teotihuacan, the fermented juice of the maguey, the nectar of the Aztec gods. Milk-white, as smooth as cream, as sweetly tart as new-made cider, it is the most healthy and cheapest liquor that is sold. For a few cents you can buy a bowl of it, in which an American schooner might be swamped.

Meandering lanes, palisaded by the organ cactus, and shaded by the red-berried, feathery-foliaged pepper-tree, lead to the huts where dwell the descendants of the great Toltecs, who troop out, offering for sale little clay and stone images — "*idolitos*" they call them — of which we bought a couple of hundred. The pencil-sketches accompanying this are fac-similes of some of them. Their variety is endless: duplicates there were none but those made by the unskilful descendants of their artistic forebears, who were bright of fancy, deft of hand and possessed of limitless patience. The head-dresses are chiefly interesting for the varied treatment of a few common forms, which carry one's fancy to the shores of the Mediterranean. The faces are full of character, the profiles clean-cut and most expressive. The qualities and passions that mould humanity now, as then, are easily read. The king in vacuous pride, vanity in a stone necklace, mediocrity in office; the priest in pompous self-sufficiency, greed, timidity, impudence — all the virtues and vices — are found portrayed in these little clay images, which will, when conscientiously studied, throw more light on the extinct civilization that evolved them than is to be got from the fanciful accounts of superstitious monks and brigand conquerors. Legends are good as the basis of a child's story, but their usefulness as an imposing framework on which to fasten historical fireworks glorifying the effigies of God-appointed kings is past.

What an attractive wealth of beauty there is in perfect health, even that of an "*Indita.*" We met a girl of eighteen years, strongly formed, full-sexed in splendid maidenhood, who offered, with charming timidity, a medley of grotesque "*idolitos*" in the corner of her "*reboso.*" She had a glowing face, red, yellow and brown, like the "*tuna castilla*" of her own neglected garden; luminous eyes, full red lips with a pouting droop, and a firmly-rounded form, pleasantly responsive to every whim of fancy, as a well-toned cord to the musician's skilful touch. Unless civilization is based on creeds, and not on deeds, so far it has done little good for her, and will probably do less in the future. Civilization — baldly practical, sordidly sensible, splendidly false — is trying, under the deceiving guise of charity, to lift the load from her strong and shapely shoulders; the load that gives firmness and depth to her chest, and dowers her with an enviable vitality, that makes of motherhood an added pleasure and a welcome duty. In some other countries not far from here, it is found more convenient to buy children rather than bear them. Like many more of our labor-saving devices, it is frightful to fancy where it is leading us. Yes! the pale-faced teachers of fashion and Christian charity will soon, for *pity's* sake, lift the burden from her shoulders and put it on her hips in the shape of a bustle, and on her head in the shape of amputated wings and vivisected breasts of birds, beds of flowers in a dozen colors, rivalling the war-paint of the "brave," humming-birds and beetles, tinted paper, painted stuffs, and — for, of course, she will soon grow bald — they will replace her glossy locks by disinfected hospital hair; and so, having abolished outdoor work as "unwomanly," they will constrain her to do scullion-work in a stranger's house or go to a factory. Soon, when there is no more work in her, she will be eligible to the charity-hospital or the poor-house. This is what we have already come to: these institutions — a blighting disgrace to the community that finds them necessary — are representative monuments of our times, as were the truncated pyramids of the times of the Toltecs. Listen! ye purple hills and billowy plains, monopolized by the few; ye prolific vales, once the patrimony of the many; the poor-house, that anti-climax of civilization, will soon be here in force, for nowadays the trail of the serpent of poverty is a double steel one, and the monster travels express.

In coming away, we found an assorted couple, grizzled and gray, furrowed and parched by uncounted years, who, with senile chatter, offered to sell us a skull. While they stopped digging to breathe freely, with suggestive pantomime, they explained that the lower jaw worked on a hinge. Although they assured us that it was a very ancient skull, our ardor for relics left us, for we suspected that they were delving in their family graveyard.

Although quite near the city of Mexico, the ruins have hardly been touched. This being so of Teotihuacan, the Holy City of the Toltecs, what can have been done towards investigating other ruins farther away from the centres of wealth and culture? In these days, a wonderful idol of stone, weighing twenty tons, is being taken to Mexico City from this place. There is still a grand chance in Mexico and Central America for an energetic, patient archæologist to make for himself an enviable reputation, and at the same time enjoy himself hugely.

N. DALMER.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF CHARLES F. BRUSH, ESQ., CLEVELAND, OHIO. MR. GEORGE H. SMITH, ARCHITECT, CLEVELAND, OHIO.

[Gelatine Print issued only with the International and Imperial Editions.]

HEADS OF MEXICAN GODS. SKETCHED BY MR. N. DALMER, M. E.

SEE article "Teotihuacan, the City of the Gods" elsewhere in this issue.

SKETCH FOR A CHURCH. MR. EDWARD STOTZ, ARCHITECT, PITTSBURGH, PA.

DESIGN FOR PRESBYTERIAN CHURCH, MEMPHIS, TENN. MR. W. ALBERT SWASEY, ARCHITECT, ST. LOUIS, MO.

ALCOVE SLEEPING-CAR. DESIGNED BY MR. F. E. STEBBINS, SPRINGFIELD, MASS.

THE views show designs for both arched roof and clerestory cars. The end platforms are so constructed as to prevent telescoping; each platform has two compound posts made of sheet-steel and wood bolted together, and which extend from the hood below the platform where they are reinforced by sheet-steel braces.

The upper berth contracts to one-half the ordinary width and

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closes perpendicularly against the car side, allowing space for high windows and making a more open car.

The bedding is placed in the alcove by day, and when removed therefrom by night ample space is afforded for dressing and undressing. Each alcove is provided with hot and cold water and wall-mirror for toilet purposes, whereby the passenger need not traverse the length of the car to reach the wash-room.

The trucks are of an entirely novel design, intended to give an easier motion than has heretofore been attained.

CHAPEL FOR ST. PAUL'S SCHOOL, CONCORD, N. H. MR. HENRY VAUGHAN, ARCHITECT, BOSTON, MASS.

This chapel with the exception of the tower from the ridge up was completed in 1888. It is now the intention of the Building-committee to finish the tower this coming summer. The external walls are of red brick and Springfield sandstone. The chapel consists of a chancel, nave, seated choir-wise, ante-chapel, organ-chamber and vestries. The altar and font are of marble. The base of the pulpit is of Carlisle stone, the upper part of oak. The stalls and benches are of oak, richly carved. Three handsome memorial windows by Messrs. Clayton & Bell, of London, are in place and others are being made by the same firm. The contractors were Messrs. Woodbury and Leighton.

THROOP AVENUE PRESBYTERIAN CHURCH, BROOKLYN, N. Y. MESSRS. FOWLER & HOUGH, ARCHITECTS, NEW YORK, N. Y.

[Additional Illustrations in the International Edition.]

THE CATHEDRAL, QUIMPER, BRITTANY, FRANCE.

[Gelatine Print.]

It may be recalled that in one of the papers on "Equestrian Monuments," the legend of King Gradlon was recited in connection with a description of the equestrian statue of the King which crowns the low west gable here shown. The view is particularly interesting because the two spires were added to the ancient edifice by M. Viollet-le-Duc some years ago.

SAVINGS BANK, LINZ, AUSTRIA. DESIGNED AND BUILT BY THE AUSTRIAN BUILDING COMPANY.

[Gelatine Print.]

A GABLE ON TAUBENSTRASSE, BERLIN, GERMANY. HERR HOLST, ARCHITECT.

[Gelatine Print.]

BLACK KNOLL, BROCKENHURST, HANTS, ENG. MR. R. T. BLOMFIELD, ARCHITECT.

JAMES STREET, BUCKINGHAM GATE, LONDON, S. W. MR. R. T. BLOMFIELD, ARCHITECT.

NORWICH, FROM THE CROMER ROAD.

The subject of this sketch might have been adapted by Nature for the use of a painter. The foreground of meadow and river is separated from the distance by a belt of trees. The rising ground beyond is also fortunately crowned by the tower of St. Giles's Church and a mill. The drawing was one of the last which Cotman made of a Norwich scene. Mr. James Reeve, to whom we are indebted for the use of the original drawing, in his memoir of the artist, says:

> The declining state of his health caused him much anxiety, and he began to feel that his duties at King's College were almost too much for his strength. He continued, however, to work on, and as the vacations drew near he looked forward with pleasurable anticipation to his usual visits to Norfolk. Some of his happiest days seem to have been spent at his work in the county and in the neighborhood of his native city. In the autumn of 1841, only a few months previous to his decease, he made a number of interesting outdoor sketches, including, besides subjects on the Rivers Yare, Bure and the Broads, some charming and vigorous effects of scenes at Cromer, Lammas, Blofield and Norwich. At the time of his visit to Norwich this year (1841) the river was unusually high. The effect produced by the flooded state of the country greatly interested him, and he went from Norwich to Yarmouth by the river, making a number of sketches on his way. These were executed on tinted paper with black and white chalk, and from the names on them, written in his usual bold hand, with the dates varying from October 9 to November 18, we are able to follow his work to the close of his life. It was the intention of Cotman to paint some of these subjects in oil on his return to London.
>
> John Sell Cotman died in London, at 42 Hunter Street, Brunswick Square, on July 24, 1842, in his sixtieth year, and, according to the register, the cause of his death, was "natural decay." He was buried in the St. John's Wood Cemetery.

CHURCH OF ST. MARTIN, SEAMER, ENG. MR. C. HODGSON FOWLER, F. S. A., DIOCESAN ARCHITECT.

This most interesting church has recently been opened after restoration. The original church consisted of tower, nave and chancel, and dated from about A. D., 1100. The north aisle, vestries, porch, with an extension of the chancel and other alterations have taken place in later times. One of the many interesting features of this church is the sanctus bell and cot, which is over the east gable of the nave. There is an old sacristy of the Perpendicular period, with a stone-groined roof on the north side of the chancel, with which it is connected by a Pointed door. The chancel arch, since the plaster has been removed and the check moulding disclosed, has a very grand effect, and the fine chancel-screen has been much improved by being raised about nine inches. During the restoration a staircase which originally led up to the rood-screen, with which it was connected by the opening on the north side of the chancel arch, was opened out. A small Norman window, with zig-zag moulding and nail-head ornamentation was also uncovered immediately above the arch leading to the vestry on the north side of the choir. There is a curious projecting figure on one of the pillars on the north wall of the nave and two similar ones on the east wall of the chancel, probably used as brackets for lights. When the north aisle was added to the church the original north wall was cut through, and part of the buttresses still remain on the piers. A new oak roof, covered with lead, has replaced the old nave roof, and a very handsome oak roof of more elaborate design has been placed over the chancel. Handsome oak choir-stalls have been placed in the chancel. An oak reredos, picked out with gold, has been erected. The nave has been reseated with open oak seats, and a handsome oak pulpit and lectern have taken the place of the old "three-decker."

THE WINTER EXHIBITION OF THE BERLIN INDUSTRIAL MUSEUM.

"All the Modern Improvements."—No. 4.

It is a question with me whether any museum in Europe is managed better than the Berlin Industrial Museum (Gewerbemuseum). I doubt even whether any American board be more alive, active and ingenious, or more earnestly bent upon using a collection exhaustively. For only to mention this one fact of the use the stores are put to—since my space does not admit of full quotations from the complete catalogues and reports—how considerable it is for students, artists and artisans on one side, and, on the other, for the general public! Regular classes are taught within its walls to profit by the specimens of perfect workmanship of all ages and countries, just as in other collections connected with art and schools; but, besides this, classes from public high and female schools, such as the Victoria Lyceum, may resort regularly with their teachers to the halls; and, what is still more, the population of the town are made into classes and are likewise taught there! It has got to be a settled plan to make announcements in the newspapers when a lecturer will be found in this or that section of the building in order to explain its stock, and the hours when the museum is closed to the tourist are employed for training home tastes. So, too, evenings when so many other galleries and museums of the world are given over to idle silence and darkness, is this of Berlin often alive with lights and audiences; the aim being to prepare consumers of a quality fit for appreciating the producers whom the industrial schools of the country educate and inspire.

On a certain scale, too, it gives the high and flattering stamp of its unsurpassable encomiums to current productions; and so keeps in feeling with manufacturers—I will mention an example or two later. They occurred in the course of the Winter Exhibition, which is an exhibition of textiles and wall tapestries.

The ordinary visitor has no idea of the riches of the Gewerbemuseum in this department, and one must be on the spot at the right moment to gain an idea. For even the method of the Germanic Museum, at Nuremburg, of setting hermetically closed-cases of embroideries and stuffs in darkened chambers is rejected as inefficient for preventing dyes from fading. The costlier and rarer specimens are hermetically packed, and the summer tourist sees nothing of them. They are exhibited in the dark winter season and, if extraordinarily susceptible or antique specimens, only for a few weeks.

When this exhibition is begun it takes place in the rooms of the inner court, and in a successive historical series, or after countries or continents: sometimes the two systems combine into an exposition that is at once a period and a local registry, since textile art has

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been confined at certain dates to one particular territory, only China having kept up a certain uninterrupted production from one century through another, and from one millennium to the next.

In these occasional exhibitions, and in this winter's particularly, Oriental art takes still the foremost place. The Italian and Spanish velvets of the sixteenth and seventeenth centuries, and our modern plushes present profounder glowing tones, and some of the most happily combined fine, faint, soft colors of the Roccoco speak with a sweeter intimacy perhaps to our northern, tempered sense. But it remains true that no European art has attained even at its zenith so *manifold* a decorative perfection as the old art of the East.

The thought occurs to one when realizing this point afresh, whether just the fact of ancientness does not constitute the real secret of superiority. Consider for a moment how the walls we are tapestrying now will look fifty or a hundred years from now after sun and gas-light have faded the dyes of them, and faded them unequally! I am thinking here of a room in the palace of Princess G., in Venice, hung still with its Turkish tapestries of two hundred and eighty years ago — and the princess told me once they were old already then — and I am unready to prophesy anything favorable unless they be like this room, or tapestried with Eastern stuff. For the brilliance of a Venetian sun and the burning reflections from the Canale Grande had not only left the colors comparatively unfaded, but in fading as much as they had, a harmony was still retained between the proportion or pitch of tones in the woof and in the patterns. Where is the European school which has experimented so long with dyes as to have won hundred-year-old knowledge as to the effect of time upon their hues, and to have come into secrets for preventing coarse disharmonies by their uneven rate of fading? It is safe to say that there is not such a school, firm or family in Europe. And yet without such experiences how is a monumental textile-art to grow up? Decorations depends upon surface qualities. A picture by Rubens with its mineral colors starting out with raw potency as their vegetable components evaporate or fade may remain a thing of beauty and a joy forever because of the spirit embodied in it. Considered as a decoration the same picture is faulty.

Oriental textiles teach us that a rag may be made as well worth preserving as a rock — unless, to be sure, this rock be a fragment of the Acropolis. In the Winter Exhibition was a piece of unshorn velvet of a brown color with an undershot of gold thread — a piece of weaving which modern art has not yet got the like of. A wall hung with this could last a thousand years, and be beautiful and refined in every one of the fading centuries; would show at least a yellowish-gray lichen dust, as it were, upon a solid yellow weft.

In the tapestries that are characteristically Oriental, or figured, the richness of color is kept in a harmonious scale between the pattern and *fond*, even in samples of the utmost wealth of number of colors. Secondly is the portion exemplary which is held between the kernel of a design and its flourishes or adjuncts; and thirdly, that which is maintained between the space taken up by these designs and the plain ground, and of both to the size of the frame or piece.

The oldest drawings are often of animal and vegetable forms. After the spread of Mohammedism vegetable and geometrical forms abound, animal-forms being relegated to such secondary sky rôles as birds and arboreous quadrupeds play between heaven and earth, — or in the region which escaped, through an oversight, the ban laid on artists by religious law-givers; a favorite *motif* being that of a song-stress or squirrel amidst leafy branches. From the sixteenth century on, geometrical and vegetable designs supersede all others; every hint of an animal form quite vanishing.

The Orientals inherited what seems like an instinct for drawing on the flat; and the countless designs already accumulated accustomed the eye unconsciously to styling natural into decorative lines; or how else is the sheer inexhaustible fulness of happy inspirations to be accounted for in the way of both animal and vegetable contours? What a clumsy object is the pomegranate,— and yet with what marvellous tact is the problem approached of transforming it to a decorative style, and with what ease and quickness is this style modified in its turn. The Winter Exhibition contains a small multitude of specimens that date from the most remote times, on through those made in Europe in the sixteenth century at Venice and Lyons *for* the East, to those of modern times. Many represent the pomegranate and its branches as golden patterns upon deep red back-grounds.

It takes the lead, in truth, among textiles with surfaces divided into fields; no other pattern, not even that of the palm and lotus, recurring so frequently: a circumstance due to the fact of fabrics being the more easily obtainable the less old they are, and this pomegranate is a comparatively new design, or a design with a symbolism that came tolerably late into great vogue: — for a meaning is attached to plants and animals, and the imagination of Oriental peoples raised first one plant form and then another into emblematical importance, just as the Middle Ages raised first the lily and then the rose.

A form of decoration which represents the opposite to the division into fields, is that of detached flowers or sprigs. When Europe adopted it, in the seventeenth century, the original colors were gradually intensified until the utmost brilliance was arrived at, when a steady decline set in and reached at last mere mist and butterfly powdery tints; the water-plants of the East were replaced by Dutch roses and tulips; and the large formalized patterns of the East were replaced by miniature natural-looking sprays of sweet-brier and pinks, suitable rather for baby-dresses, or at most for girls' boudoirs than for hall tapestries.

But Oriental art speaks half stutteringly in forms; its eloquence is color. The Museum displayed quantities of fabrics in which the drawing was reduced to such simplicity or heightened to such complexity as to be of very little moment: in one case square lines and quadrâts strewn upon a large space of plain ground; in the second, so many of the same figures, one inside the other, as to present mere fine lines of countless hues, — a tapestry of a *genre* similar to that of Indian and Persian shawls, and needing, like these, to be hung in ample folds. The directors introduced some contemporary textiles in this last-mentioned style from the factory of Sluck in Cracow, an old factory — as they made known to architects whom it might concern — employing descendents of Persian silk-weavers who were brought to Poland two hundred years ago. The stuffs, as hung on brazen rings, receive only a portion of the life by day which they unfold under strong gas-light, when the sharp lines of sudden shadow cut off piquantly the mannered confusion of their unfollowable and uncountable lines: like a tragic sorrow, the intrigues of an aristocratic mind.

An uncommon supply of costly textures from the farthest Orient, from China and Japan were good contrasts to those of Middle Asia, both through the style of their patterns and the *technique* of the same. The latter in China is certainly studiedly made effectful, and before a tapestry after drawings by Ho-Kusai, Raphael's and even the Turkish work of Scutari appear helplessly naïve. For Raphael's are woven with inferior thread and those of Scutari are complete as a woof. Your Chinese tapestry of the choicest sort combines weaving, painting and hand-stitching: the hand-stitch being most often the flat sketch, whether the thread be fine silk or the unwieldly, stiff wire of gold.

A crane embroidered in this stitch upon a painted background in colors to imitate nature and in a size fitted for a wall panel, was made to show both the sleek gloss of wing-feathers and the rumpled, wetted down of pin-feathers — a wonderful feat. But embroidery among the Chinese is really needle-painting, or just what the Oriental word for it implies.

Now, so great as our wealth is, shall we be likely to use much of it? Masterpieces are extremely dear even in China, and although this Exhibition shows furnishings for costly walls, it has no full number of the very rarest Chinese tapestries, but only pieces. And yet no one less than Baron von Brandt manipulated the fortune that has gone into this section,— a section recognized as one of the finest in Europe, as well as the most complete.

Contemporary German productions contain painted silk and velvet stuffs, in large Chinese patterns. A fashion already exists for them. The embroidery, however, is limited to such portions of the drawings as the rim or throat of flowers, the outlines of foliage masses, or the high lights on marine surfaces. The Winter Exhibition shows no native German imitation on a scale more ambitious in embroidery — this last luxury in decoration — than this of supererogated lines: save, of course, in small objects, such as fire-screens. We can conclude from this fact how the market stands. For it is one of the advantages of the Museum that, in want of yearly National Industrial fairs, enough additions are secured to the historical stores on hand, to initiate students and practical architects into the very newest adoptions in the world of decorative art.

COUNTESS V. KROCKOW.

THE RUNNING-EXPENSES OF THE BOSTON MUSEUM OF FINE ARTS.

A YEAR ago the Trustees of the Museum of Fine Arts found themselves compelled by the needs of that institution to appeal to the public-spirited citizens of Boston for means to carry it on. Fifteen thousand dollars were needed for current expenses, in addition to the income of the Museum applicable to that purpose, and to provide this sum the Trustees asked for fifteen hundred subscriptions of ten dollars. The response was most generous and encouraging; 1,002 persons contributed $10 each, while larger amounts than the circular called for carried the total sum received to $12,530, thus fully justifying the confidence felt by the Trustees that there were many persons in the community who would be glad to share in the support of the Museum were the opportunity offered.

During the past year the extension of the Museum has been completed, more than doubling its previous capacity; large additions have been made to the collections, notably of casts and objects of Japanese art, and these have been incorporated with the objects previously deposited, the whole being systematically arranged throughout the galleries. This re-arrangement made it imperative that the building should be closed to the public for nearly three months, a necessity which the Trustees especially regret, as it has deprived the annual subscribers of a portion of their privileges, and their leniency is asked in view of the exceptional condition caused by the enlargement.

The increased size of the building and of the collections will greatly increase the cost of maintenance, and for the coming year the Trustees will need at least $15,000 from annual subscriptions to meet the current expenses.

The Trustees, therefore, gratefully acknowledging the hearty response to their previous appeal, venture to repeat it, and ask for subscriptions of ten dollars each. They invite all those who contributed last year to do so again, and would also ask their coöperation in obtaining new subscribers.

If each of the present subscribers were to add a new name to the list, the Trustees would have an income adequate to the support of

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the Museum, and would even have some addition to their actual very limited resources for increasing the collections.

The Museum of Fine Arts receives no aid from the State or the City; it depends wholly upon voluntary contributions. It has been built and filled with precious works of art which give pleasure and instruction to thousands, solely by the liberal action of individuals, not many in number. It rests its claim for help only on the service its renders to the public; and, in again appealing to the public for a wider support, the Trustees feel that they may hope for a general and generous response.

Each subscriber will be entitled to a transferable ticket, admitting four persons to the Museum on every day in the year on which it is open, up to April 1, 1891.

NOTES AND CLIPPINGS

Convention of the Plate-Glass Works. — The advance in the price of glass in other countries has been quickly followed by a like movement in Germany. The table and lighting glass manufacturers have succeeded in forming a convention of long duration which includes all but a few small and unimportant works. The higher prices thus brought about are justified by the 15 per cent advance in the men's wages, the increased cost of coal = 50 per cent, the increased cost of chemicals averaging 20 per cent, and that of packing material as straw, etc., 90 per cent, and by the fact that work can only be carried on on 26 Sundays, instead of 52 as hitherto, whereby the continuous firing of the furnaces will increase the working-expenses. The convention has got upon firm ground, it appears to be well-organized and is connected with a bank which is prepared to take from the manufacturers for export any accumulating stocks, in order that in the event of any reserve on the part of the great inland buyers, who are not friendly to the increased prices, regular outlet may be open and in that way offers under the convention prices may be prevented. The scheme for uniting all the lighting-glass works into a large company has been definitely abandoned, as several banks had refused to participate therein and none of the other negotiations were attended with success. — *Invention.*

Electric Welding. — A few weeks since a naval board was ordered by the Secretary of the Navy to convene at Boston, for the purpose of reporting upon the advisability of generally adopting the Thomson electric-welding process, with the view to using the machines of this company in the various navy-yards and on board the government cruisers, etc. This board met in this city, and after several days' careful investigation made a unanimous report recommending the use of the machines by the navy in its various departments. In this report they state:

We are convinced that the Thomson welding process can be found of great utility to the naval service, both on shore and afloat, for the following reasons: It can be used —

(*a*) In welding breaks in rods without altering them either in length or shape.

(*b*) For welding tubes.

(*c*) For welding angles and shapes of intricate form.

(*d*) For welding copper, brass, cast-iron or other metals.

(*e*) For heating metals for forging, tempering and upsetting.

(*f*) For welding wire cables.

Under these heads the following may be mentioned as a few of the many applications that would result on shipboard: For welding broken pump piston-rods, valve-stems, etc.; for joining wires of iron, copper, or other metals or bars of the same, of similar or different shapes or sections; for making joints at angles with bars (T or Y joints); for mending chain and wire rope; for constructing or joining, end to end, pipe of all kinds, and of large or small diameter; working or joining lead pipe; welding T-connections, or elbows into lines of piping; welding safe ends to boiler-tubes; repairing boiler-tubes; welding eye-rings, and welding these again to bolts or bars; repairing, cutting and boring tools without hurting their temper; lengthening or shortening rods or bars; repairing broken cast-iron pieces of machinery or broken cast-iron or cast-brass fittings; welding copper electric mains. The system of welding thus renders easy many operations in the working of metals which with the forge and smith have hithertofore been considered impossible. It is the unanimous opinion of the Board that in the present day of ships constructed almost entirely of metals, and in which every fitting possible is made of metal, such a system as that which has been investigated by us becomes not only desirable, but a means to economy of expense, time and labor, and would add to the efficiency of the vessel under any condition of service. This system of welding occupies a position of its own; it is able to do not only a large part of the work of the forge now in use, but is capable of doing much work that was hitherto considered impossible. By its use, the large accumulation of now almost worthless boiler-tubes stored at the navy-yards could be made fit for service; and the quantity of spare tubes and of many other stores now carried by ships could be reduced.

Cheap unbaked Colored Brick. — Dispatches from McKeesport, Pa., announce that the brick manufacturers of that city and Pittsburgh, are becoming interested in a patent chemical process for making brick without the usual burning which has always proved necessary. The process is that of a Western man, and it is claimed that the brick can be made and hardened in two days at a cost of two dollars per thousand, or at one-half of the average price per thousand that stock brick are made in yards where brick is burned. Another feature is, that the process will permit the brick to be made in all colors, and that the hard article for street improvement can also be made. A number of McKeesport capitalists are interested in it, and should it prove what it is they will locate a large plant to manufacture by this process. — *The Industrial World.*

TRADE SURVEYS

There is a more or less unsettled feeling among commercial, financial and manufacturing interests over the effect of a discounted decline in cost of production and prices for all commodities and services. Every one recognizes that a constant adjustment will be necessary. Ordinarily, competition and the law of supply and demand will take care of this. It has been the study of the leaders in the great avenues of trade and commerce for some time past to devise some way for getting around the operation of this law, or, at least, to protect themselves in part from its effect. One of these methods has been through combination; another, through advantages secured by legislation. The average man sees no harmful results from the sharpest possible competition, nor from the gradual decline in prices and cost of material. Those only are apprehensive who are aiming to secure a little more than what rigid competition will allow. The barricades which legislation has for years past been building up around special interests are gradually going. Never before in our history has the individual possessed so many advantages. It may be said that the enormous combinations of capital controvert this statement, but a little closer inspection will show its correctness. Business methods are simply passing out of one stage or condition into another and a higher one. As the apprentice system has disappeared from our industries, so is the system of production and exchange being modified by being placed upon a broader basis. Where there was one opportunity for one dollar to make another dollar twenty years ago, there are now manifold opportunities. It is right here that the interests of the masses are best protected against the largest possible aggregations of capital. These combinations have their place, and will develop strength and weakness, and create opportunities for smaller combinations of capital which do not now appear on the surface. The truth of this is manifested almost daily in commercial and manufacturing circles. Conditions and methods which the scholarly socialists of thirty or forty years ago wrote about and dreamed of are now growing up about us as naturally as though the soil had been especially prepared for them. The constitution of society itself seems to be changing; or rather, the elements within it are being shaped to make possible the accomplishment of results and achievements which, a few decades ago, were not dreamed of as possible or as desirable. Business is done differently to-day from what it was thirty years ago. Even banking methods are changing, and only the other day the banking world was surprised by the presentation of a proposition from one of the most prominent senators in the country to give governmental sanction to a scheme which, even ten years ago, would have been pronounced as utterly socialistic, as revolutionary, and as being at war with common-sense and the best interests of the banking and non-banking public. While such schemes may not go through now, there is no telling what may come of it.

Of one thing we may rest assured, and that is, that there is a strong popular feeling among the agricultural and industrial interests in favor of anything or any scheme that will restrict the franchise and the power of the money-lender, on the one hand, and which will facilitate the obtaining of needed loans on the other. The senator whose name has been coupled with this scheme may not comprehend the ulterior consequences of such a movement, but the flood of telegrams and letters by way of remonstrance against even the entertainment of such a proposition must convince him that the established order of things, financially speaking, will not acquiesce in any disturbance of fundamental notions. Ideas of similarly revolutionary import are cropping out in other directions; on the one hand, we find "things as they are"; on the other hand, and opposed to them, we find "things as they ought to be." A sort of Bellamy philosophy is pervading the minds of the common people; it is not necessary to waste too many words or too much space upon the new ideas, methods and systems that are shaping and evolving themselves among the masses of former wage-workers who have recently become petty or large employers, farmers, shop-keepers, and the like. A new race of thinkers is coming to the front; they are weighing everything which affects their interests by standards of their own making. Trade conditions are still satisfactory to the money-lender, the transporter, the manufacturer and the cultivator of the soil. The Northern farmers are complaining of deficient markets and low prices, while the Cotton Belt people and the Southern lumber manufacturers and iron-makers are all rejoicing over abundant business, good prices and bright prospects for continued activity. Production and consumption are adjusting themselves to new conditions. If there is any dulness in trade at present, it is due to a doubt as to whether prices during the coming ninety days will harden or weaken. A fair trade is reported in every direction. Buyers want to know whether production is to be whipped up to a mile-a-minute speed, or to be kept within bounds. A vast amount of business is being done this week and this month at prices which have been settled for the rest of the year. The action which laborers are taking may be called conservative; but they are profiting by past experience, and are avoiding extreme demands. Employers are inclined to make concessions. The disposition to do so has conciliated the wage-workers in advance. Authorities who are qualified to speak for employers in several of the larger cities have recently given it as their opinion that moderate concessions, especially in the building trades, will avert a general strike. It is a little too soon to make such a positive statement. Great activity prevails among shops and manufacturing establishments of all kinds. In all sections of the country there is an abundance of work. Locomotive-builders are especially busy. The policy of the railroad companies to improve their properties has sent an immense amount of work into equipment-shops within the past month. The farmers, notwithstanding low prices, are active buyers of implements, and a much greater agricultural area will be cultivated this year than last. After a score of ineffectual efforts the Northwestern railroad-managers think they have hit upon a plan to say how traffic shall be divided, and to agree upon the prices that shall be paid for railroad services. In the lumber trade hemlock and yellow pine have been advanced in primary markets, and the mild winter will somewhat lessen the supply from Maine and Michigan sources. In the coal trade prices have been cut from 10 to 40 cents per ton on coal sold in large quantities in Eastern markets. In Western markets no reductions have been made, as the development of new industries there about keeps pace with the increased supply. The multiplication of new industrial enterprises in the South continues without abatement, and Northern capital, which has been so well compensated in that section, is still catching at every attractive opportunity offered.

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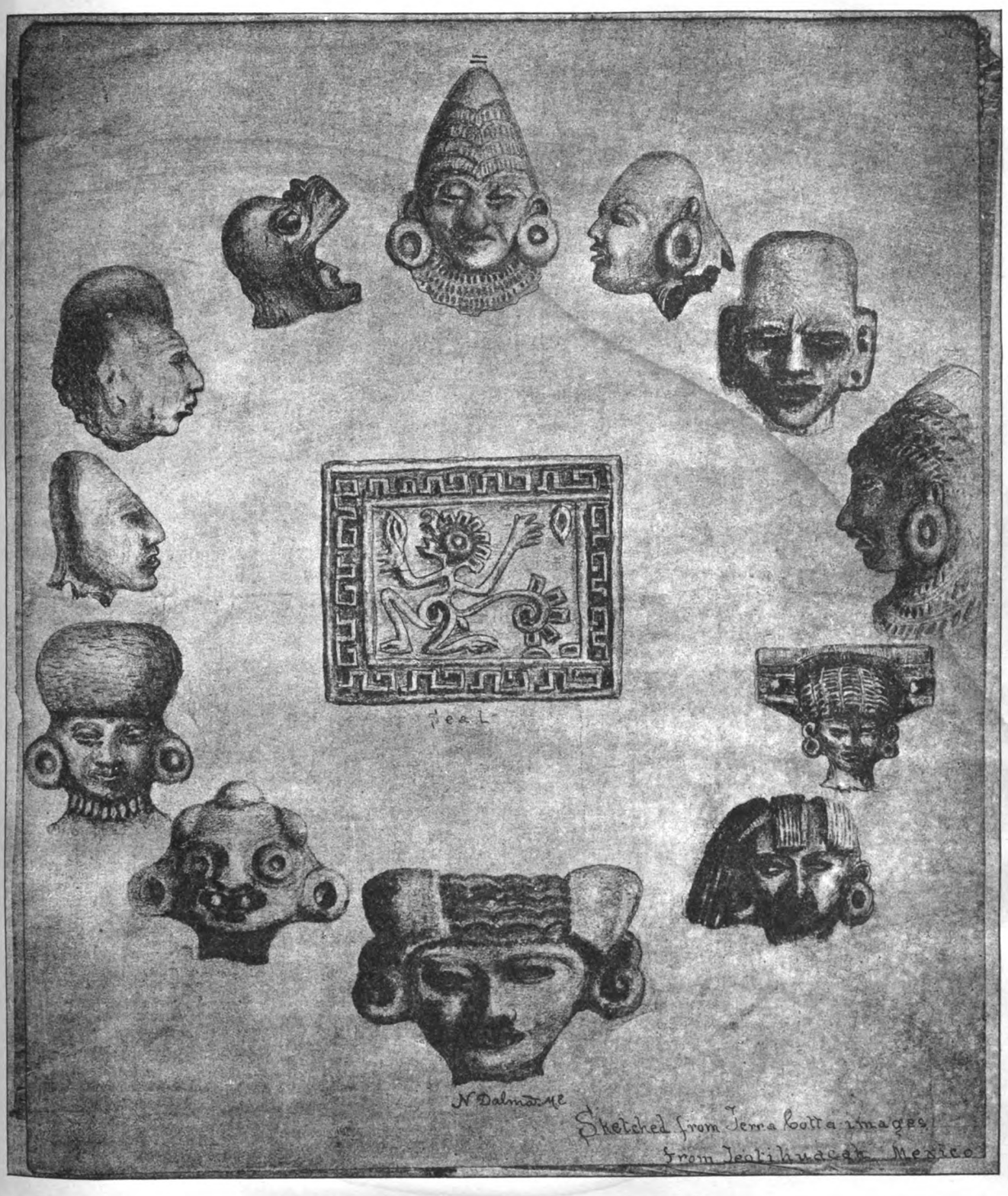

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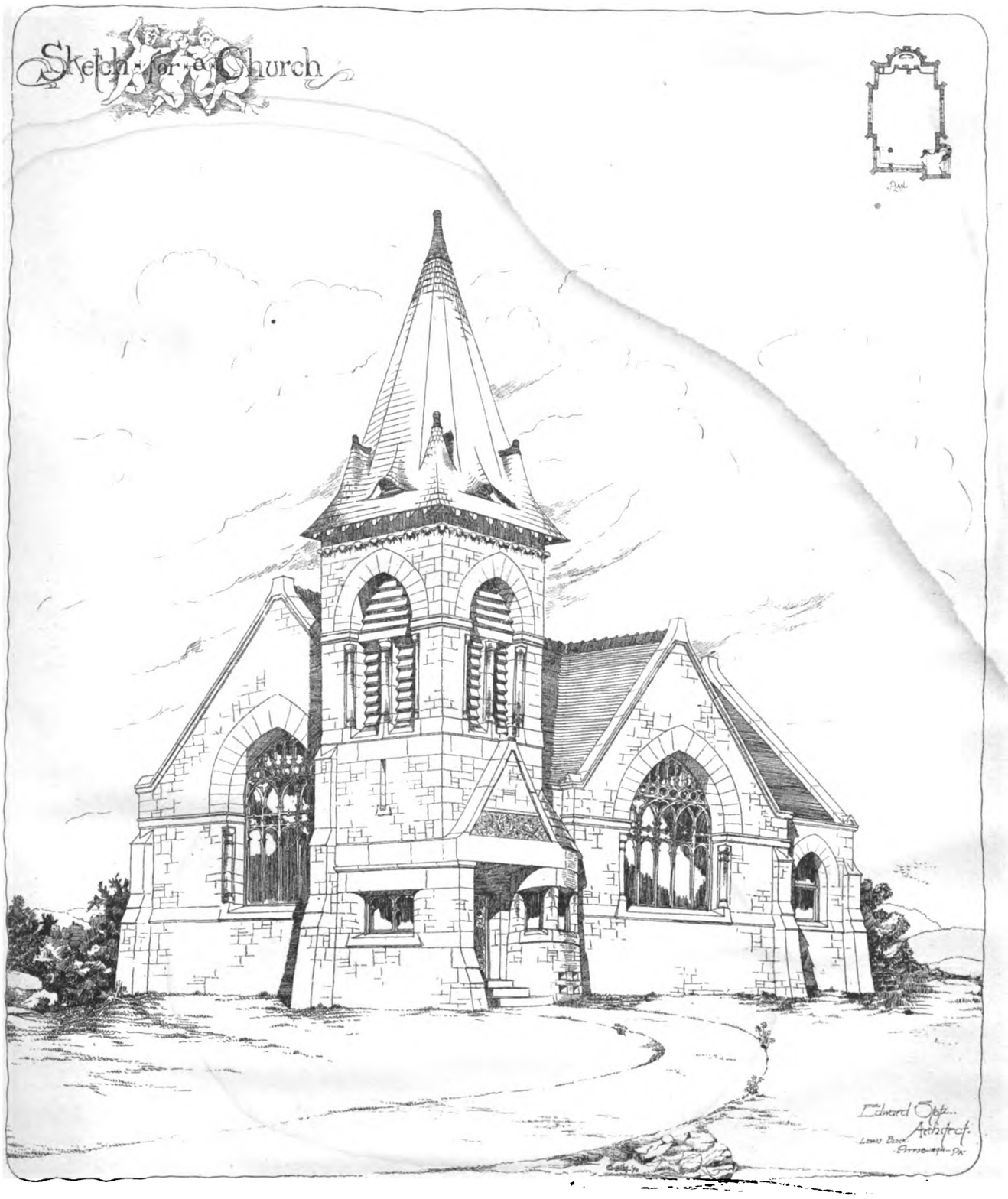
Sketch for a Church



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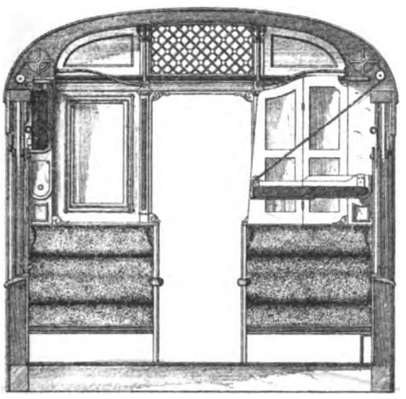
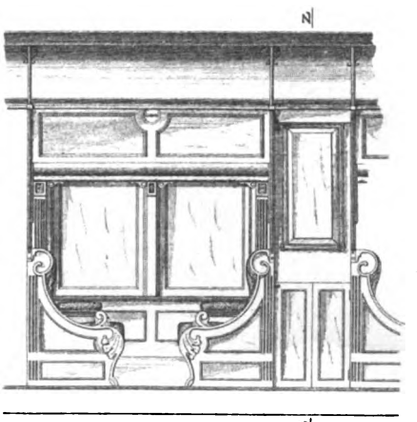
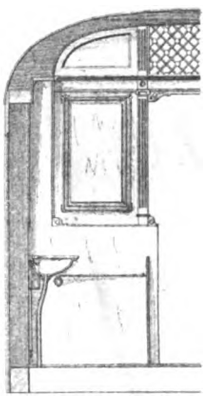


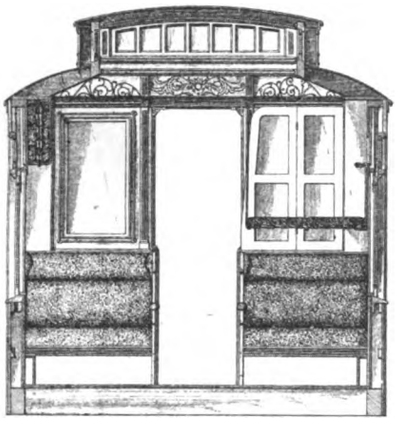
— Cross Section of Car at Y-Y —
— Showing Berths in Position —



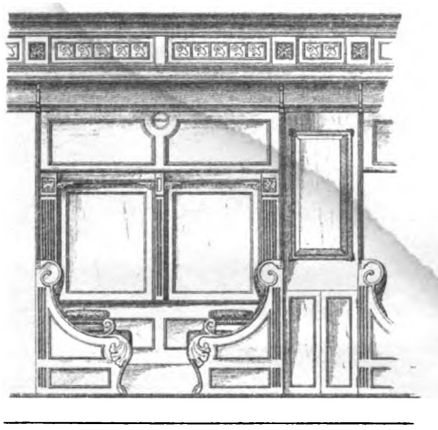
— Side Elevation of Car —
— Showing Alcove & Upper Berth closed —



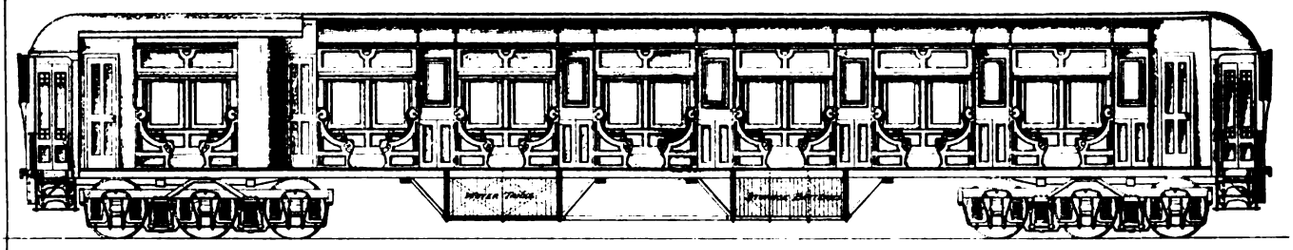
— Cross Section at Z-Z —
— Through Alcove —



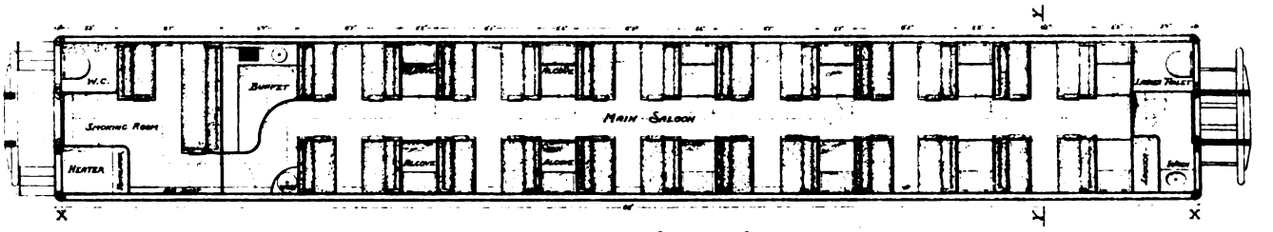
— Cross Section of Deck Roof Car —
— Showing Berths in Position —



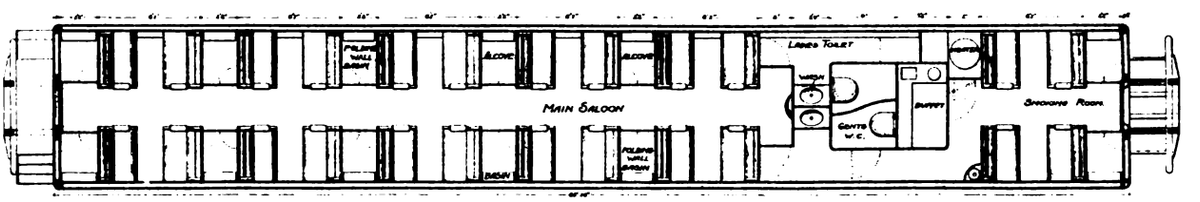
— Side Elevation of Deck Roof Car —
— Showing Alcove & Upper Berth closed —



— Longitudinal Section of Car through Line X-X showing Interior Finish —



— Plan of Alcove Sleeping Car —



— Plan with noval Toilet Arrangement —

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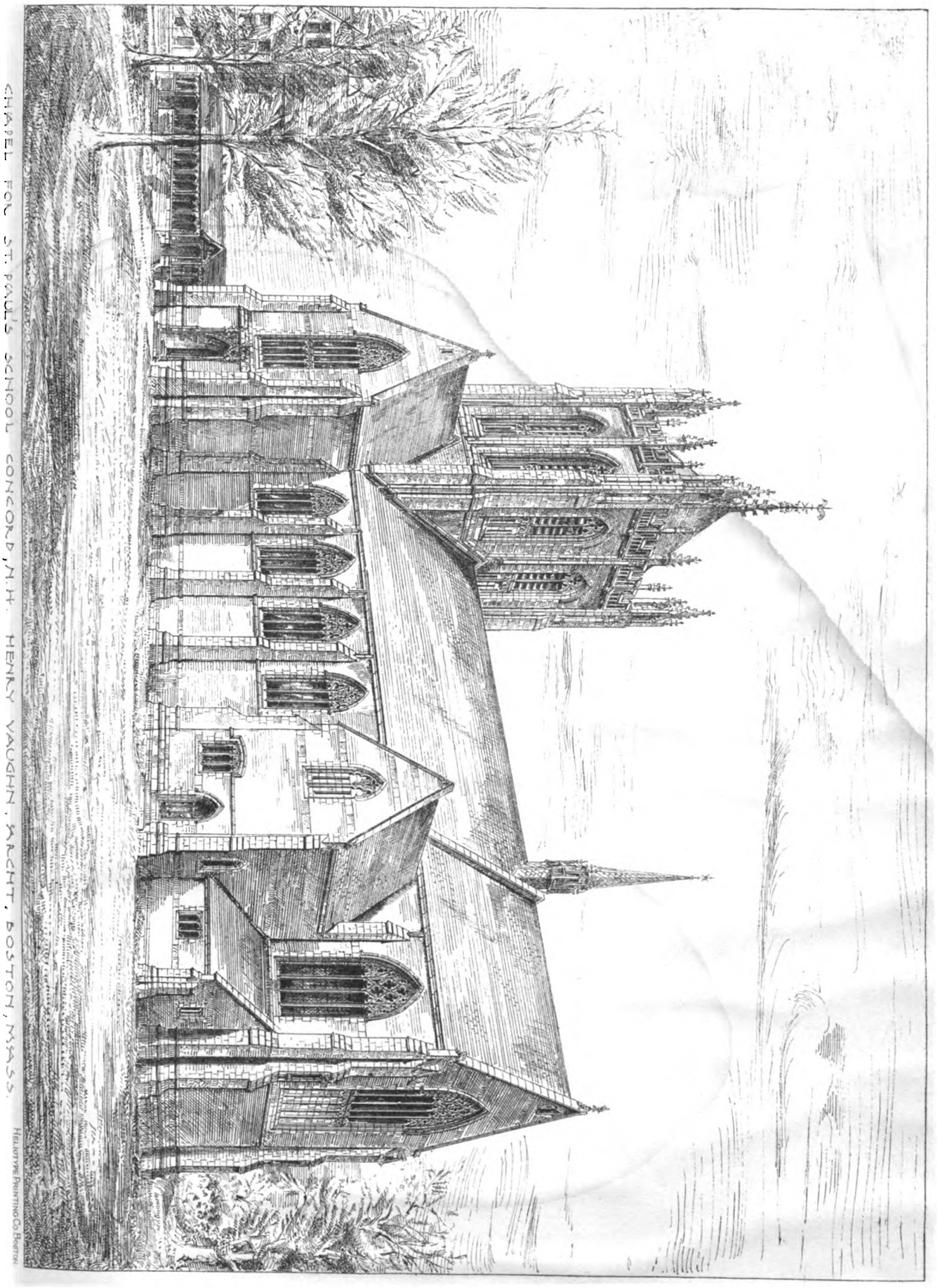

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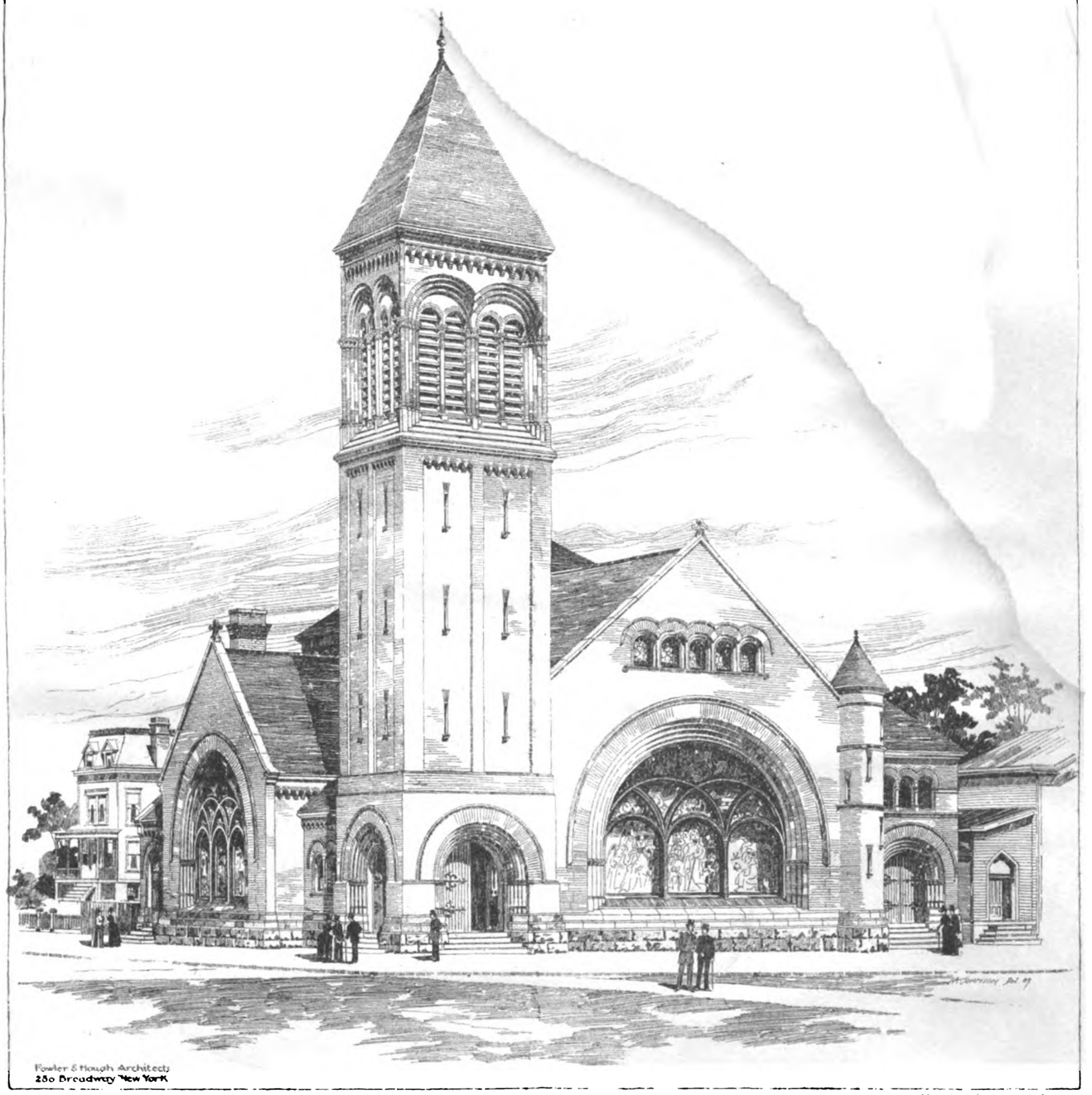

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THE AMERICAN ARCHITECT AND BUILDING NEWS.

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MR. NORCROSS, of Worcester, who is by far the most extensive builder in this country, and perhaps in the world, as well as the owner of many quarries of nearly every sort of building stone, and ought thus to know what he is talking about, makes a communication to the Springfield *Republican* about the stone-cutters' demonstration in Boston, which, although somewhat alarmingly personal, gives an interesting view of the details of the quarrels and of the management of the Freestone-Cutters' Union. While he acknowledges that there are good men in it, he says that "the bad element is constantly in control," and compares the Union to "the association of grinders which Charles Reade tells about in his story of "*Put Yourself in His Place.*" We imagine that the same comparison has occurred to a good many people, who remember how the tools in Mr. Carew's shop, during his struggle with the Union last year, were twice collected by unknown hands and thrown into the dock, and who have observed, as we have, the relentless cruelty with which non-Union men are hunted out of the places where they, for the moment, find employment; but even the Grinders' Union of the story, although it blew men up with gunpowder if they transgressed its rules, conscientiously kept its doors open to new members, while the New England Freestone-Cutters' Association last year "closed its books," shutting out all further accessions to its numbers, and placing the monopoly of the entire trade in the hands of five or six hundred men, who, in the present state of the law, are allowed to prevent any one else, no matter how skilful or industrious, from earning his living by cutting freestone in New England. As there are probably at least a thousand skilled freestone-cutters in New England, the action of one-half of them, and those controlled, as Mr. Norcross says, by the "rum and loafer element," in shutting out the other half from all participation in the business, is only surpassed in coolness by the claim, publicly made, that the object of its performances is "the defence of human rights."

THE Annual Report of the Boston Manufacturers' Mutual Fire Insurance Company furnishes its usual amount of interesting and useful information in regard to the causes of fires in mills. It is curious to notice the evidences of steady improvement in mill-construction, as well as the novelties, so to speak, in incendiary conditions, which the insurance engineers have constantly to meet and study. Among the latter, the most important is probably the practice, which has within the last year become very common, of sending from the South bales of cotton containing crushed seeds, the oil from which heats in the bale and causes spontaneous combustion. The presence of such crushed seeds, which were totally unknown in baled cotton until within a few years, is probably due to a change in the process of ginning, but many fires have already occurred from this cause. The principal improvement to be observed in mill-construction is undoubtedly the more general introduction of efficient automatic sprinklers, which are credited with having extinguished nearly one-half the fires, while pails of water conquered a large part of the rest. The action of the sprinklers is well described by the observation of a mill-hand, who reported to the manager that the cotton in the picker-room had caught fire, but that just at that moment, by a "curious coincidence," the water-pipe burst and put the fire out all by itself, and it is interesting to see how accurately these little watchmen open just where they are needed, and how energetically they fight for their owners. In one case, the mill was struck by lightning during a thunder-storm, and smoke was seen issuing from the belt-tower, an extremely dangerous place, as it communicates with all the stories of a mill. The fire-pumps were started and the hose laid to the tower, but, on investigation, no fire was to be found, but only a single automatic sprinkler in operation just over the bearing of the main shaft on the first floor, this little device having subdued a fire under conditions which, as the report says, no other form of fire-apparatus has yet been able to cope with. Another incipient conflagration, under very different circumstances, was also extinguished by sprinklers in a curious way. On the evening of the Fourth of July, a rocket came through a window into a weave-room in a cotton mill, and exploded under the looms, of course setting fire instantly to several of them. The room was furnished with automatic sprinklers, which immediately opened, and when the watchman, who had heard the explosion and the subsequent sound of the spray from the sprinklers, arrived at the spot, the fire was nearly out, and a few minutes' further sprinkling extinguished it entirely.

IT is said, we do not know with how much authority, that one of the buildings for the Exhibition in 1892 in Chicago will be an iron tower, sixteen hundred feet high. The plans of the tower, which have already been made, propose a structure in the shape of a truncated cone, four hundred feet in diameter at the base, and two hundred and seventy-six feet at the top. No elevators are to be used, but the ascent will be made by means of spiral roadways. One of these, the outer one, consists of a staircase, with steps seventy feet long, which will serve for pedestrians and for a double line of cars, which are to run at intervals of one minute each way. Within this outer spiral is another, of a grade so gentle that carriages can be easily driven up and down. Near the top is to be a hotel, ten stories high, with restaurants and so on. The scheme does not seem impracticable, and there is certainly an advantage in getting rid of the elevators for ascending. The elevators in the Eiffel Tower are said to have caused so much seasickness that the majority of the passengers went no higher in them than the first landing, and the ride in them was at best uncomfortable; while the ascent of the Chicago tower, in roomy cars, which, by their spiral movement, will show a constantly changing prospect, seems likely to be a very agreeable experience, and particularly so to the residents of the Mississippi Valley, to most of whom the inspection of a landscape from an elevation of sixteen hundred feet will be a novel expericnce.

MR. EBENEZER L. ROBERTS, a well-known New York architect, died at his house in Brooklyn last week. Mr. Roberts was born in Connecticut in 1825, and was first apprenticed to a carpenter; but, when twenty-five years old, he came to New York, and soon established himself as an architect, gaining an excellent reputation. He designed the Standard Oil Company's Building on Broadway, the Ninth National Bank, the Baptist Church of the Epiphany, on Madison Avenue, St. Paul's Methodist Church, on Fourth Avenue, the Phœnix Insurance Company's Building in Brooklyn, and many other important structures in the sister cities.

THE issue of *Engineering* for February 28, which is devoted entirely to an historical and technical description of the Forth Bridge, is the most extraordinary feat that technical journalism has ever accomplished. It contains seventy-six

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large quarto pages of text, illustrated with one hundred and sixty diagrams and engravings, and, in addition, seventeen double-page, half-tone engravings; even on the thin paper used for foreign circulation, each copy of this issue weighs one pound and thirteen ounces, and yet a single copy sells for six pence! Do our subscribers, who often heap scorn upon us when we now and then draw their attention to the fact that their own interests are intimately connected with the amount of advertising we can gather into our own pages, imagine that these six pennies present the cost, and a profit thereon, of manufacturing such an amazing issue as this Forth Bridge number? Neither *Engineering* nor any other journal could give its subscribers such an excess of value for their money if it did not enjoy the support of advertising manufacturers and dealers, and it could not have this support if English advertisers did not understand the value to themselves of advertising in technical journals to a greater extent than do Americans, and if English subscribers did not take the trouble to make sure that English advertisers should "hear from" the cards they place in it. It would be a direct benefit to themselves if our own subscribers would only properly appreciate the fact that all architectural journals — in this country at least — have to contend against the stubborn fact that architects are not themselves the *consumers* of the goods which dealers advertise, and so do not have occasion to put themselves in communication with such advertisers in a way to prove to them that they are "hearing from" their advertising outlay. It would seem in face of this undeniable fact that our subscribers would see that it is for their own interest to assure dealers that they do see, note and remember the facts they advertise. When we receive the same kind and amount of support that *Engineering* enjoys, we, too, can be as enterprising. We know that we are just stewards of the income that passes through our hands, we believe that our sense of justice will not wane when that income is many times what it is now, and we can assure our subscribers that in place of giving them as now a journal which costs only twice or thrice what the subscriber pays for it, we can then give him one which costs even ten times the subscription price.

A CONTRACT has actually been signed for the construction of the East River Tunnel, which is to cross the channel between South Street, Brooklyn, and Broome Street, New York, and operations are to begin within a few weeks. The tunnel is planned on a new, if not questionable system, known by the name of gravity transit, the profile of the tunnel being similar to that of a double toboggan-slide, so that trains, after starting from one end, will coast down a steep hill for about one-fourth the distance across, then, by the impetus thus gained, travel along a level road for two-thirds the remaining distance, and then, having arrived at the foot of the opposite slope, be dragged up, by a cable or otherwise, to the farther terminus. It is obvious that this principle of design is very suitable to a submarine tunnel, where descent must be made on each side, and the history of mountain railways shows that steep grades may be traversed with safety, but the experiment of setting a train loose, without power of checking its own progress, to coast down a steep hill, is a new one.

AT a recent meeting of the Architects' and Engineers' Society of Munich, Professor Ernst Fischer, of the Technical High School, gave an interesting lecture on "Lead Pencils." According to him, the first people to devise some more convenient writing instrument than pen-and-ink, or sticks of charcoal, were the Italians, who had, in the sixteenth century, pencils made of a mixture of lead and tin, with which they executed what are now known as "silver pencil" drawings. At this time graphite was known, and occasionally employed for rough drawing, but the quality of the material then found was poor, and its principal use was for making crucibles, for which a great deal of coarse graphite is still consumed. In 1564, during the reign of Queen Elizabeth, a deposit of pure graphite was found at Borrowdale, in Cumberland, and for centuries afterward the Borrowdale graphite held a monopoly of the market. Great efforts were made to develop and perfect the manufacture of pencils, made from this graphite, tempered with clay, and enclosed in wooden cases, and they were exported from England all over the world. The administration of the Borrowdale mine was very judicious. By six weeks working every year enough graphite could be extracted to make all the pencils that could be sold at a remunerative price, and this limit was strictly adhered to, although the value of the six weeks' product was about two hundred thousand dollars. This graphite was so pure and uniform that for many years the leads for pencils were sawed from solid blocks, which were cut first into slices, and then into slender bars. The round leads for ever-pointed pencils were made by turning the ordinary pencil bars in a lathe. The strictness of the English monopoly stimulated Continental manufacturers, not only to try to discover graphite deposits at home, but to make pencil leads out of graphite dust, cemented with gums or sulphur. In this they were partially successful. In Bavaria several small mines were opened, and both in Germany and France tolerable pencils were made out of graphite dust, compressed into moulds in a vacuum; but the English pencils held the first place until some twenty or thirty years ago, when the Borrowdale deposit suddenly gave out. By this time, the German pencil manufacturers had perfected their processes, so as to make good pencils with their own graphite, and the familiar name of A. W. Faber, which belonged to an establishment founded in Nuremberg in 1760, began to be seen on pencils in every part of the world. In 1871, John Peter Alibert, while prospecting for gold in the mountains of East Siberia, near Irkutsk, found in a valley some pieces of pure graphite. He was sensible enough to give up his search for gold, and endeavor to develop his new discovery, but it was not until 1879 that the Alibert Mine, after the expenditure of an immense amount of money, was brought into profitable and regular operation, probably with the financial aid of the Fabers, who contracted with Alibert for the entire product, and still control it. The quality of the Siberian lead appears to be excellent, and the Fabers now send out, from their Nuremberg factory alone, nearly a million pencils every working day.

IT will be remembered that the Minister of Commerce in Hungary recently adopted some energetic reforms in the way of passenger rates over the Government railways, dividing the country into "zones," and fixing the price of tickets in such a way that travel in the remoter and less densely populated regions was cheaper than in the more populous districts. A supplementary regulation was put in force last month, less radical, perhaps, but very convenient for the public, and, one would think, likely to be profitable for the railroads. Under the new regulation, railway tickets are sold, not only at the stations, but at all post and telegraph offices, in all hotels, and at places specially provided for the purpose. These tickets are good for transit through the number of zones marked on them, beginning the trip anywhere. They may be had for a single journey or to go and return; they are good at all times, and on all trains, and may be sent to any distance from the point where they are bought, to be used by friends or others. For the information of persons not yet accustomed to this novel fashion of railway administration, a pamphlet of explanation is given without charge to any one who asks for it. Railway officials will look with much curiosity to see the results of the new management, but it certainly seems as if some of the innovations were particularly well suited for adoption in this country, which, like Hungary, is vast, thinly settled, and traversed by great systems of railroad which have now hardly business enough to pay their operating expenses.

THE *Scientific American* says that the paraffine process, applied to the Egyptian obelisk in the Central Park, New York, for the purpose of preserving it from the effect of the weather, has rather increased than diminished the disintegration of the surface, and, at the present rate of decay, the obelisk will be entirely unrecognizable in sixty or seventy years. The most injurious part of the application seems to have been the preliminary heating of the stone, which opened the seams, burnt out the fungi which had accumulated in them, and served to keep out the weather, and, by expansion, opened new seams. The workmen, also, knocked off pieces where seams appeared, and confess to having removed nearly half a ton of fragments from the beautifully polished and sculptured surface, while the actual amount was probably much more. It seems to us that there should be no delay in getting the stone under cover. Few people probably know that there is, or was, a large piece of polished and sculptured Egyptian syenite, apparently a part of a broken obelisk, in the garden of a house at Waltham, ten miles from Boston. Thirty years ago or more, this stone, which was brought from Egypt as a curiosity by the owner of the estate, was in good preservation, but we believe that it decayed rapidly later. If it is still in place, it would be interesting to know its present condition, as a warning of the fate which awaits the New York obelisk unless a room can be found to put it in.

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MILITARY ARCHITECTURE.[1] — I.

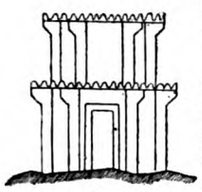

Fig. 1. Fortress of the Time of Menephtah I.

TO whatever remote period we trace the history of the human race, we encounter evidence that the struggle for existence is coeval with the life of man. At first it was a conflict of individual against individual, but, when the social instinct had awakened, it expanded into warfare between different peoples.

As soon as man had learned how to build himself a dwelling, he was compelled to protect it against attacks from without; so that, along with the development of civil architecture, there was a corresponding development of military architecture. The latter, therefore, comprises *all the methods of construction as applied to the defence of localities*, as well as the *special buildings designed to shelter troops*. This branch of architecture then presents two main divisions, *Fortifications* and *Barracks*.

A marked correlation, due to the character and tendencies of their originators, evidently exists between civil and military structures of the same period, and in the same country. But, setting aside certain general elements, the two kinds of architecture are distinguished from each other by dispositions which are peculiar to each, because they are destined to answer special needs.

The points in common belong to the method of construction and to architectonic details; but the accommodation of a structure to its position constitutes one of the characteristics of fortified works, and concerns the military engineer alone.

Military engineers have been guided from earliest times by the same principles; the only change has been in the mode of application, and the reasons for such variations are to be sought especially in the improvement of weapons. Military architecture has, therefore, been undergoing transformations down through the centuries, while still preserving in each age the character impressed upon those imposing or mysterious ruins which have been brought to light by the patient toil of archæologists.

ANCIENT PERIOD. — EGYPT.

We learn from historians and from epigraphic monuments that the Egyptians turned their attention to works of fortifications even in remotest antiquity. Diodorus Siculus relates that Sesostris caused a wall, 1,500 *stadia* in length, to be constructed from Pelusium to Heliopolis, to guard against the incursions of Arabs and Syrians ("*Hist.*" lib. 1). Heliopolis itself, which, according to the Biblical account, was a flourishing town in the days of Joseph, doubtless possessed at that early period the walls which can still be traced. The fortified city of Tanis, in Lower Egypt, already existed in the time of Abraham.

Without, however, going back to such a remote age, valuable information concerning the primitive Egyptian fortresses can be obtained from a painting on the Tomb of Rotei at Beni Hassan el Gadîm. This is a monument of respectable antiquity, since it dates from the twenty-second century before our era.

The general character of the fortresses of the Egyptians was dictated by the nature of their country, which was flat and subject to inundations, and at the same time by the comparative weakness of their poorly-armed nomad enemies. They had nothing to fear but the scaling of their defences, and against this mode of attack the elevation of the walls was the most efficient protection. No heed was given to trace or flanking; the enceinte was oftenest of rectangular shape, with no towers and no outworks other than the external counterforts, which were usually built to assure the stability of the walls (Figure 1). To escape the inundations of the Nile, the fortress proper was constructed on a platform made of the earth from the surrounding canals, and protected by a lower exterior wall ("*Herodotus*," II, 97, 137).

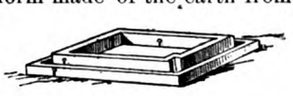

Fig. 2. Military Post of Chounet-ez-Zérib.

The military post at Abydos, known under the name of Chounet-ez-Zérib (Figure 2), offers a very well-defined type of this general disposition (Mariette, "*Abidos*," Desc-t.-II).

It may seem astonishing that there are so few remains of Egyptian military architecture, but this fact is readily explained when we recall that, although stone was used in the erection of temples and tombs, military structures were almost exclusively of the ordinary building material of the country; that is, of crude brick made from the clay of the Nile and dried in the sun. Time finally destroyed the clay, sparing only those monumental stone gates which, in their enigmatical isolation, so long defied the investigations of travellers.

ASSYRIAN EMPIRES.

The empires of Babylon and Nineveh, sometimes rivals and sometimes joined under one sceptre, possessed the same civilization and the same arts.

The Babylonians dwelt in the centre of a clayey plain, where trees and rocks were very rare, and they were, therefore, compelled, like the Egyptians, to build their fortifications of brick. They consolidated these, however, by beds of bitumen and reeds, which they had at hand.

The Ninevites, although possessing stone quarries, built all their edifices of brick, a custom doubtless borrowed from their neighbors; but they used stone for the basements and revetements. The monarchs were accustomed to have their exploits engraven on these revetements, which were of a fine-grained limestone.

The military scene which we reproduce (Figure 3) is from a bas-relief of the Palace of Khorsabad. It is very characteristic, and shows that the fortresses erected on rocky eminences often comprised several concentric enceintes; these were sometimes strengthened by detached works. Unlike Egyptian enceintes, which were almost always destitute of towers, the fortifications represented on Syrian monuments are abundantly provided with them. A crenellated battlement juts over the facing of the towers, and presents the appearance of machicolations.

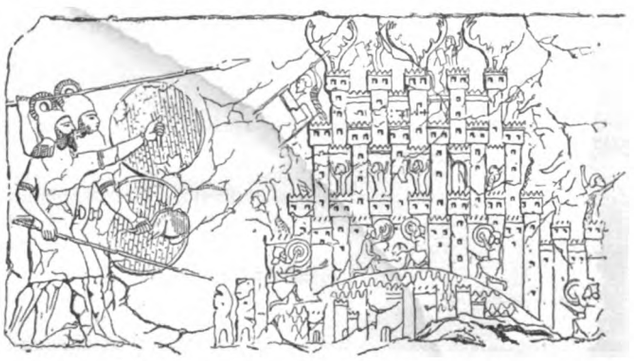

Fig. 3. Bas-relief from the Palace of Khorsabad.

GREECE AND THE COASTS OF ASIA MINOR.

During the heroic period, that is to say until toward the twelfth century before the Christian era, Greece was divided into a multitude of separate small States. These were governed by kings, who established their dwellings in central positions or on elevations, whence, like the feudal lords of a later time, they could keep watch over their domains and detect the approach of an enemy. Under shelter of the fortifications reared about these abodes of the petty Hellenic tyrants, temples were erected and cities grew up around their foundations.

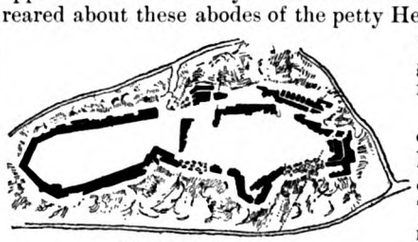

Fig. 4. Plan of Tiryns.

The oldest Greek constructions all belong to the Cyclopean or Pelasgic system. They consist of enormous masses of rock piled together in a rudely polygonal disposition. The citadel of Tiryns (Figure 4) offers a curious example of this arrangement (Schliemann "*Tiryns*").

The ancient part of the wall of Mycenæ, which is supposed to date back to the sixteenth century B. C., presents, on the contrary, an example of regular polygonal disposition. The blocks are fitted together, sometimes with great nicety, but with no mortar or cement of any sort.

Between the time of the Trojan War and the wars with Darius and Xerxes (from the twelfth to the fifth century B. C.), the cities of Greece gradually grew in importance. Suburbs were one by one surrounded by walls, so that a city became at

[1] From the French of A. de Rochas and G. Espitallier in Planat's "*Encyclopédie de l' Architecture et la de Construction.*"

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length an aggregation of quarters, each of these with separate fortifications. In such cases the original enceinte remained as the main fortress and took the name of *acropolis*.

It was during this period that the regular polygonal disposition, with vertical or oblique joints, was definitively adopted, and that towers began to appear in the walls. These were at first erected only at the angles and near the gates, but the

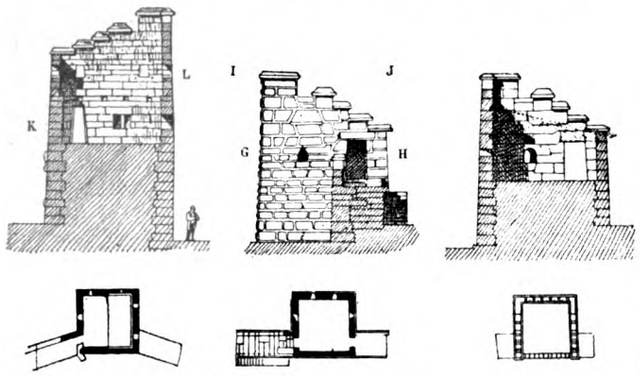

Fig. 5. Towers of Messene.

number was increased later on. The oldest are round, the most recent square, as at Messene (Figure 5); at Gortys they are regularly spaced, about 115 feet apart.

The foundation of the Persian Empire by Cyrus, and the expeditions of the great eastern powers against Greece gave a new development to the methods of fortification on the soil of Hellas.

The cities along the coasts, which had been built at some distance from the sea, as a safeguard against pirates, fortified their defenceless ports and established a secure way of communication with them between long parallel walls; Athens, Megara, Argos and Corinth furnish examples of such cities.

Was the military architecture of Greece indigenous to the country, or was it in some measure derived from Oriental peoples dwelling in Asia Minor? This question is difficult of solution. The sea was a bond of union, rather than a means of separation, between Hellas and the rich cities along the shores of Asia Minor. In both, the development of the arts was nearly simultaneous, and an examination of the fortifications around Heraclea of Latmus or Sardis, for example, discloses a close relationship with Hellenic enceintes of the same period.

The industrious and independent Phœnicians, on the other hand, though doubtless derived from the ancient Assyrians, brought an ingenious sagacity to the construction of their port defences (Figure 6); unfortunately, the long sieges of the times of the Crusades render it difficult to determine with certainty the epochs of existing Phœnician ruins; it is rather in the colonies of this little nation of merchants that we must look for the best examples of its military architecture; for instance, at Lixus in Mauretania Tingitana (now Morocco), at Thapsus and Hadrumetum, and above all in the formidable walls of Carthage, heir of the mother city, and whose engineers, later on, built Eryx and Syracuse in Sicily.

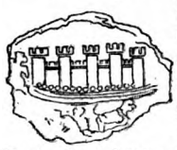

Fig. 6. Tyre, from a Phœnician Coin.

In the fourth century B. C., notable progress was made in the art of siege and consequently in the art of fortification; the impetus was due mainly to Dyonisius, Tyrant of Syracuse, and to the Macedonian engineers of Philip and Alexander.

The ramparts, instead of merely encircling the cities, were now forced to occupy the naturally strong points of the ground by means of salients, behind which the intervening curtains did not meet [Rhodes]; this is the first appearance of the dominating principle of modern fortification.

The need of a less divergent flanking became apparent. The trace *en crémaillère* was adopted for all long sides running in a right line.

Then the square towers were built in such fashion as to present always a salient angle to the enemy; the object of this was, not only to break the force of projectiles hurled from the huge engines of this period, but also to allow of a complete lateral flanking.

The curious didactic treatise of Philon of Byzantium gives a very good summing up of the rules admitted in the art of fortifying cities during the second century B. C.

The curtains were strengthened by making them of earth confined between two face walls, as at Pompeii (Figure 7).

In other cases the ramparts comprised a mask wall, strengthened on the city side by a series of vaults supporting the terre-pleine [Rhodes, and Aurelian's Wall at Rome].

At this period, a broad ditch was always dug before the walls. Philon even demanded that there should be three

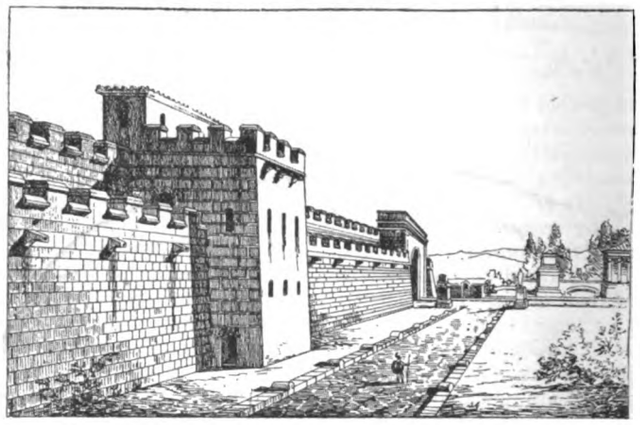

Fig. 7. Walls of Pompeii.

trenches, as at Rhodes, so as to prevent the assailants from setting up their hurling engines within 560 feet of the enceintes: beyond this limit catapults throwing projectiles weighing a talent could not harm masonry.

The influence of Philon of Byzantium was felt over the entire eastern basin of the Mediterranean down to the time of the Crusades. However, in the fourth century, in large cities

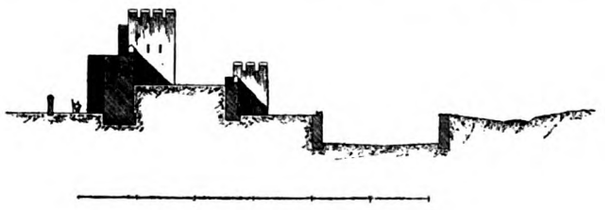

Fig. 8. Byzantine Enceinte of Constantinople.

like Constantinople and Nicæa, attention was directed less to what may be termed the Byzantine engineer's geometrical dispositions of detail, and more to the securing of defensive force by doubling the lines of fortification (Figure 8).

ROMAN EMPIRE.

The Romans made no innovations in the trace of the fortification; they merely imitated the Greeks, to whom they often showed themselves inferior on this point. But in the application of the art they were able to bring to military construction methods in which they were unrivalled (Figure 9).

What the Greeks could not teach them, since the political constitution of Hellas had never suggested its need, was the application of this art to a *plan d'ensemble* for the defense of a country's frontiers. The Empire, in its ceaseless growth, soon felt the necessity of protecting its borders against turbulent

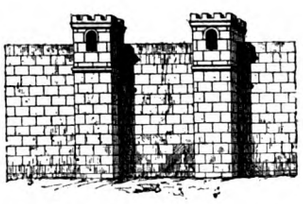

Fig. 9. Walls of Verona: from the Arch of Constantine.

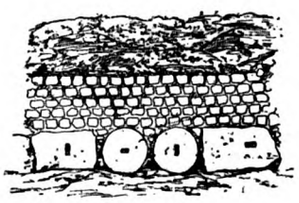

Fig. 10. Part of the Exterior Wall of the Castellum of Jublaius.

neighbors. Valentinian covered Gaul with fortified posts, and all through the south of this most favored dependency of the Empire, as well as along the German frontier, their imposing remains are still to be seen. But the dikes thus thrown up against the threatening tide of barbarian invasion were all in vain. They were scarcely finished when the men of the North

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feet; outside length, 512 feet; dome, inside, 200 feet; dome, outside, 240 feet; height to ball at base of a cross on dome from floor of church, 555 feet; height to ball at base of a cross on dome from level of One Hundred and Tenth Street, 596 feet; height of front towers from One Hundred and Tenth Street, 360 feet. The dome is placed on the line of One Hundred and Twelfth Street.

DALMENY CHURCH, LINLITHGOW, SCOTLAND.[1]

[Issued only with the Imperial and International Editions.]

"THE small village of Dalmeny stands a short distance westward of the great north road from Edinburgh, where it approaches Queen's Ferry. Unlike other Scottish villages which generally consist of a narrow and filthy street, where the dwellings are as densely crowded together as if they were in the centre of a city, the few houses of which Dalmeny consists are separated by a broad green, and they have a clean, airy, healthy appearance. Abundance of woodland, scattered over picturesque broken ground, is in its close vicinity, and occasional glimpses may be had of the scenery of the Frith of Forth and the distant ranges of hills. In this quiet and pleasant spot, stands, almost entire, one of the most truly venerable and interesting specimens of ecclesiastical architecture of which Scotland can boast. Dalmeny Church is in the purest Norman style. It is a simple quadrangular edifice without tower, aisles, or transepts, although an unadorned projection on the north side may possibly have been added as the commencement of a transept. The windows have all the small Norman arch with toothed mouldings. A horizonal moulding runs along either side near the roof, which appears to have consisted of a series of intertwined curves like the letter S laid longitudinally, but which seems to have been supposed by the architect who has restored part of it, to be a succession of crescents lying with their concave sides alternately upwards and downwards. Above this is a row of carved heads, presenting the variety characteristic of such buildings. The main entrance door is in a porch projecting to the south, the archway of which is supported on two plain pillars with Norman capitals. There are over this door the remains of a line, concentric with the arch of sculptured figures and animals, many of which are fabulous, and have a considerable resemblance to those which appear on the ancient sculptured stones scattered throughout Scotland, by which the acuteness of antiquarians has been so effectually baffled. On either side of the arch are the remains of a statue, and from a curved mark on the masonry, connecting the two together, it may be inferred that some moulding — probably in the form of a cord — united them together. Over this doorway is an arcade of interlaced Norman arches highly ornamented. In front of the porch lies one of those old stone coffins, frequently found in Scotland, of which the interior was cut out in such a shape as to fit accurately to a body swathed in bandages like an Egyptian mummy, there being a circular cavity for the head, a channel shallower and narrower to contain the neck, and a larger excavation for the rest of the body, broadest and deepest at the place where the shoulders are to lie, and becoming narrower and shallower towards the extremity corresponding with the feet. Archæology has not yet thrown any light on the period when the narrow house first assumed this substantial character; but it is observable that stone coffins of this description are generally found near the places where the most ancient existing churches stand, or where such edifices have existed, but are no longer standing.

"The interior of this small church has a fine massive simple effect. The chancel is in the form usually called an apse, and consists of a semicircle with the arc outwards, under a groined arch, the ribs of which are deeply moulded and ornamented with tooth-work. The small chancel is, according to a common arrangement, lower than the rest of the church, and the difference in height has been very skilfully adjusted in such a manner as to enhance the effect of the perspective from the western end. The arching of the chancel appears to be in its original condition. The two departments into which the rest of the church is divided, appear to have been in some measure restored on the pattern of the chancel. The church has been fitted up with pews and a gallery, and it is much to be regretted that portions of the shafts of the pillars, and some other parts of the internal stone-work, have been cut away for the purpose of economizing the space, and facilitating the transit through the church. The fabric was repaired, and in so far as restoration seemed necessary, put in its present position in 1816."[2]

THE GREAT HALL, CRAIGIEVAR CASTLE, ABERDEEN, SCOTLAND.[1]

[Issued only with the Imperial and International Editions.]

"THIS fine specimen of the Franco-Scottish fortified mansion hides itself in the unheard-of parish of Leochel, one of the most remote and pristine districts of the north. It is sometimes inhabited and is in good preservation. Its uses, as a fortress against the Highland reivar rather than as a mere dwelling-house, are recalled by all its attributes of sullen strength, and not less startlingly by the admonition round the shield, by which the adventurous intruder is warned against the temerity of awakening sleeping dogs. All its details have been so fully developed in the accompanying plates, that a description of them is unnecessary. Not many years ago, the general effect of the edifice was destroyed by the presence of two towers, which have fortunately been removed. They were built by an architect who would not condescend to study the style of building peculiar to the north, and, being called on to make additions to a castle, could do so no otherwise than in the English baronial style. All that is now to be regretted is, that, to make room for what he probably considered decided improvements, he had altered some parts of the original structure. The landscape around will be as unsuitable for the spreading pomp of an English hall, as it is in accordance with the tall narrow clustered tower. It is a succession of bare round hills, brown with heather, save where the white masses of granite crop outward, like the bones of the earth projecting through its skin. Throughout these lonely hills and glens the remains of ancient warfare are thickly scattered. Weapons, generally made of stone, are frequently dug up; the outlines of the hills are in some places altered by ancient embankments and intrenchments; a cairn marks the spot where Macbeth is said to have fallen; and near it are the ditches and embankments of a fortification, which even the sceptical Lord Hailes believed to be as old as the days of the renowned usurper. These matters, however, carry us into a far earlier period of history than any with which Craigievar Castle can be associated. The domain belonged of old to the family of Mortimer, who are said to have commenced the building of the castle, but lacked funds for its completion.[3] It was purchased in 1611 by William Forbes of Menie, a cadet of the worshipful family of Forbes of Corse, who had a history, then rare among the Scottish country gentlemen, as we are told that he, 'by his diligent merchandizing in Denmark and other parts, became extraordinary rich.' 'He completed this castle,' says the same writer, 'and plaistered it very curiously.'[4] His son and successor, William, was created a baronet of Nova Scotia in 1630. Sir William Forbes was one of the few Aberdeenshire lairds who, in the troubles of the seventeenth century, adopted the cause of the Covenant. He was one of the Commissioners at the Treaty of Ripon, and a man of note, both in the field and in the cabinet, during those wild times. He frequently appears in the picturesque pages of Spalding, and his domain was subjected to such inroads as the following: 'He [John Dugar, a Highland freebooter,] did great skaith to the name of Forbes — such as the Lairds of Corse, Leslie, Craigievar and some others; abused their bounds and plundered their horse, nolt, sheep, goods and geir, because they were the instruments of Gilleroy's death; and the Forbeses concluded to watch his comeing and goeing, and to get him if they might.'[5]

"It is a remarkable circumstance, however, that many of these remote northern fortresses are more eminently connected with the literature than with the warlike history of the country. A few miles on the one side of Craigievar stands Crathes, the ancestral abode of Bishop Burnett and his eminent kinsman; while on the other side Craigston recalls the name of the fantastic scholar, Sir Thomas Urquhart. Craigievar is in a similar manner connected with literature, chiefly ecclesiastical. The elder brother of the merchant who founded the family was Patrick Forbes, Bishop of Aberdeen, a man eminent for the unambitious sincerity with which he discharged the duties of his office, and held honors which were rather thrust on than desired. Like Robert Leighton, he had the rare fortune, while filling a prelate's chair, to make himself acceptable, by his moderation, his Christian virtues and his learning, to the enemies of Episcopacy. He was the author of some works known to the curious in ecclesiastical literature, and was the object of many able posthumous eulogies, published in a collected form as 'Funeral sermons, orations, epitaphs and other pieces, on the death of the Right Reverend Patrick Forbes,' reprinted for the Spottiswood Club. The simple people of the district had their own way of commemorating his theological triumphs. In connection with the ruins of his Castle at Corse, it is said, 'tradition bears, and the common people still believe, that the Devil visited the Bishop in this Castle; that they differed; and that the Devil, on his departure, carried away with him the broad side of the Castle, on the stone stairs whereof they still pretend to point out his footsteps.'[6] His son, John Forbes, was the leader of that band of Aberdeen Doctors who carried on a tough controversial war with the Covenanters, on whose side his cousin was doing battle with the sword. His theological works, published at Amsterdam in 1703, in two volumes folio, are well-known, even beyond the circle of theological students."

HIGH SCHOOL BUILDING, CAMBRIDGE, MASS. MESSRS. CHAMBERLIN & AUSTIN, ARCHITECTS, BOSTON, MASS.

HOUSE OF J. R. BURNETT, ESQ., MOUNTAIN STATION, ORANGE, N. J. MR. F. W. BEALL, ARCHITECT, NEW YORK, N. Y.

HOUSE OF G. W. FRANK, ESQ., KEARNEY, NEB. MESSRS. FRANK, BAILEY & FARMER, ARCHITECTS, KEARNEY, NEB.

TOWN-HALL AND CENTENNIAL HALL, SYDNEY, N. S. W.

[1] It should always be kept in mind that these illustrations from the "*Baronial and Ecclesiastical Antiquities of Scotland*," [1845] by R. W. Billings, are republished very largely for the sake of giving instruction in one manner of the rendering of architectural drawings.

[2] New Statistical Account, Linlithgowshire, p. 102.

[3] New Statistical Account, Aberdeen, p. 1109.

[4] View of the Diocese of Aberdeen, (Spalding Club,) p. 599.

[5] History of the Troubles, i. 85.

[6] Old Statistical Account, vi. 220.

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[**Additional Illustrations in the International Edition.**]

PALACE OF COUNT PALLAVICINI, VIENNA, AUSTRIA. HERR VON HOHENBERG, ARCHITECT.

[Gelatine Print.]

HOUSE OF HERR J. BENIC, KARLSTADT, CROATIA, AUSTRIA. HERR HANS PRUCKNER, ARCHITECT.

[Gelatine Print.]

PAINTING OF M. PUVIS DE CHAVANNES IN THE NEW SORBONNE, PARIS, FRANCE.

[Gelatine Print.]

ALL SAINTS CHURCH, FINCHLEY ROAD, ST. JOHN'S WOOD, LONDON, N. W. MESSRS. CHRISTOPHER & WHITE, ARCHITECTS, LONDON, ENG.

We publish this week an illustration of the new tower and spire, and conversion of the original base for a tower into a porch, at All Saints Church, Finchley Road. The whole of the work has been done at the expense of the Rev. H. S. Eyre, who was for some years the vicar of the parish. On examination it was found that the foundation for the original tower and spire were not sufficient, owing to the proximity of the Underground Railway, which has been constructed since the church was built. It was therefore necessary, either to pull down the original base and carry the foundations down to the level of the bottom of the railway, or to build the tower and spire on the other side of the church. On the whole, if was considered better to convert the original base for tower into a two-story porch, and to build the new tower and spire on the south side, as this permitted of a more picturesque arrangement of the west front, and was at the same time more convenient for the congregation during the execution of the work.

FOLKTON MANOR HOUSE. MR. E. J. MAY, ARCHITECT.

MILL POND FARM, CRANBROOK. MR. M. E. MACARTNEY, B. A., ARCHITECT.

ACOCKS GREEN BUILDING ESTATE, BIRMINGHAM, ENG. MESSRS. ESSEX & NICOL, ARCHITECTS, BIRMINGHAM, ENG.

The elevations are carried out in Adderly Park red bricks, with Corsham Down stone dressings and finishings, the roofs being covered with red tiles.

BOSTON

THE OPENING OF THE ENLARGED MUSEUM OF FINE ARTS.—THE CASTS, NEW AND OLD.—THE PAINTINGS.—THE JAPANESE COLLECTIONS, ETC.

The Museum of Fine Arts was opened to "private view" on Tuesday, preliminary to its being opened to the public. The collections in each department have been greatly increased, and now compare favorably with those of museums of art abroad as well as in America. In the number of casts of classical sculpture, the museum now stands third, the Berlin Museum easily leading the list with 2271, while that of Strasburg has 819, as compared with 777 in the Boston Museum. The Japanese collection is now unrivalled and is likely to remain so, as a similar collection could scarcely be made in Japan, so depleted have the best works of Japanese Art become. The collection of glass, pottery and porcelain, while not large, is exceptionally fine, and the art galleries have now in their midst a room devoted to the Barbizon School, which has examples of the very highest merit. But, apart from the quantity of works exhibited, there are two things to be especially noticed in the Boston Museum under the new order of things, the fact that there has been exceptional discrimination shown in choice of material, and that the material has been extremely well-arranged. It has been so long the custom that a Museum of Fine Arts should be a mere *olla podrida* of all sorts of things, that it is most encouraging to recognize the acknowledgment of the use of a museum as a source of instruction, either actual or by suggestion.

This is especially manifest in the arrangement of the casts of classical sculpture, which is made chronological, and at the same time produces an increased artistic effect, as each room has a character of its own and is not a mere collection of incongruities.

The casts have also cards upon their pedestals, stating not only the subject, but the date, the locality where found, the name of the sculptor, and the present locality of the original, a marked change from the lack of method of previous years, when the uneducated were left purely to conjecture and surmise.

The additions to the building, begun by Mr. John H. Sturgis and completed by his successors Sturgis & Cabot, have been carried around three sides of a rectangular court of which the older building forms the north side and the additions the two ends and the south side.

The plan shown will give an idea of the disposition of the rooms.

The walls of the court, which are in buff brick, reflect much light and all the rooms are excellently lighted.

The entire first floor with the exception of the two rooms for Egyptian and for the Greek, Roman and Etruscan antiquities, has been devoted to casts of sculpture, arranged with the exception of the Renaissance rooms and the Egyptian rooms, by Mr. Edward Robinson, curator of Classical Antiquities.

Entering as formerly into the central hall, which remains practically unchanged and turning to the right, the first room entered is the Egyptian and Assyrian room, containing bas-reliefs from Nimroud and Koyunjik of sieges and of the hunt, and a large relief of Sete I, attacking a city of Palestine.

Next is a room of Archaic Greek sculptures of the sixth century, B. C., including the Selmunte metopes, the Assos reliefs, the Samian Hera, and the especially fine relief of a figure mounting a chariot from the Acropolis Museum at Athens.

Near the north wall is a pseudo-Archaic pedestal showing the later affectation of the earlier forms.

Next are two pre-Phidian rooms, the central group in the first being that of the Tyrannicides, Harmodias and Aristogeiton, erected at Athens, a group of great power. It is interesting to compare the heads of the two figures, that of one being the original of the Archaic type, while the other is the head of an athlete, of the fourth century B. C.

On the western wall is the western pediment of the Zeus Temple at Olympia, with the contest of Apollo and the Centaurs, while the eastern pediment is on the north wall; opposite is the western pediment of the Ægina Temple, with the contest over the body of Patroclus, while below are the Discobolos and the Marsyas of Myron.

The second pre-Phidian room is especially interesting from its examples of the works of Polycletes, of which there are three. An Amazon in the Berlin Museum, the Doryphorus of Naples, the Diadumenos from Vaison. The great dignity, simplicity and breadth of the work of Polycletes could not be better shown. In the centre is the boy extracting a thorn (the Spinario) from the Capitoline Museum and there are also the Discobolos of the Sala della Biga in the Vatican and the Borghese Achilles of the Louvre.

The chronological sequence is here broken by the necessary introduction of a room which has been devoted to small bronzes and busts. The busts are arranged in three rows around this room, the Archaic busts being placed on the right of the entrance. There is a very interesting comparison of similar types made in several cases, where the heads of six different athletes are placed side by side, while the head of the Hermes of Olympia is placed above them, showing a uniform type and manner of handling.

The same comparison has been made with several heads of Aphrodite, including the so-called Clytie. The busts of the Emperors are on the south wall. The central case of the little bronzes from the Berlin Museum is exceedingly interesting. Similar types here also have been placed beside each other, as those of Aphrodite, of Athena and of Heracles. The sequence is again resumed in the Parthenon room, which, as is the Hall of the Caryatides at the other end of the building, is one of the most effective rooms in the Museum. The eastern and western pediment-sculptures of the Parthenon are upon two large pedestals in the centre of the hall, with copies of Carey's drawings, on the sides of the pedestals.

The cella frieze is carried around the entire room in two rows, so that the Panathenaic procession can be followed by the eye much better than in the British Museum. On the north wall is a small model of the Acropolis, and between the windows is the small statuette of Athena from the Acropolis Museum, with the attributes of the Athena of the Parthenon. The Phigalia frieze alone, placed under the ceiling on the north wall, is the only piece of sculpture which does not belong to the Parthenon.

The metopes are high on the south wall. It is a most agreeable surprise to find the pedestals in this room painted light, thus forming a consistent whole with the sculpture. Everywhere else in the building the pedestals are dark, and create disturbing spots of color. The long south corridor has examples of the Hellenistic period from the fourth century B. C. The principal figure at the west end is the "Victory of Paionios," mounted upon an abbreviation of its pedestal. On the south wall are funeral stéles, while on the north wall are the Nereids of the Xanthos monument (which are labelled "Victories" in the Metropolitan Museum in New York), the Niobe group and the relief of the Siege of Troy found in Lycia.

The central portion of the corridor is divided by screens projecting from the walls into double alcoves, of which the first is filled with the works of Praxiteles, with the Hermes of Olympia in the centre, the Apollo Sauroktonos of the Vatican on one side, and the "Marble Faun" of the Capitoline on the other. Beside this "Faun" is a *torso* of another and much finer copy from the Louvre.

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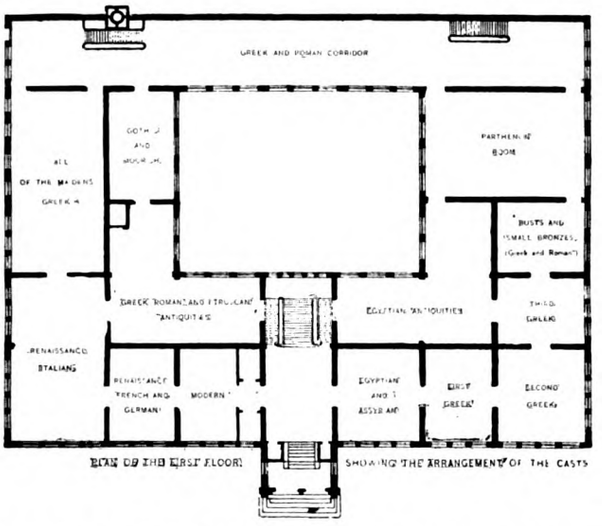
The second alcove has the resting Hermes of Herculaneum from the Naples Museum in the centre, on one side the Ludovisi Mars, on the other the Apoxyomenos, on the south wall the Alcestis relief from the base of the column to the Temple of Diana at Ephesus, with the capital above; while on either side of the entrance to the third alcove are two of the best of the new acquisitions: the youthful Dionysos from Hadrian's Villa, found a few years ago, a very simple, beautiful figure, and an athlete pouring oil into his hand, from the Glyptothek, Munich, an extremely vigorous and active figure, with fine pose, especially to the head.

The third alcove has in the centre the "Uffizi Wrestlers," on the sides the Eschines and the Sophocles, and three new statues: an exquisite dancing "Bacchante" from Berlin, "A Boy," also from Berlin, and the "Eros" of the Capitoline, by Lysippus.

The fourth alcove has also two new statues: the "Venus Genetrix" from the Louvre, and the "Eros" of Praxiteles from the Vatican. Beyond these are the "Menander" and its companion, the "Posidippos" (a new cast). The "Demosthenes," "Ariadne," and



"Agrippina" and the Capitoline "Venus," and two new casts, "A Youth" from the Villa Albani, and the "Orestes and Electra" from the Villa Ludovisi. At the end is the upper portion of the Choragic Monument of Lysicrates, and, on the staircase, reliefs from the Column of Trajan. The vista through this south gallery is especially fine.

The Hall of the Caryatides has the Caryatide Portico at one end and the Pergamon Altar relief at the other, and in the centre groups of the dying Gauls. On the sides are examples of the Pergamon School: the "Laöcoon," Barberini Faun, and the "Diana of Versailles," Torso of the Vatican, Satyr from the Theatre of Dionysos, Athens, and the seated Athlete (bronze) recently found in Rome.

This completes the Classic Collection, which is very full and representative, and, as will be seen, arranged most successfully.

The chief acquisitions in the Renaissance room are the Siena pulpit, the additional figures needed to make the Tombs of the Medici complete, Michael Angelo's "Moses," the Donatello "St. George" from Or'San Michele, Florence; the Tomb of Ilaria from the Cathedral at Lucca, the Tomb of Guadarello Guadarelli from Ravenna, the Marsuppini Tomb in Santa Croce, by Desiderio da Settignano; two Lucca della Robbia tympana, several of the Innocenti from the Hospitale, and an exquisite group by an unknown hand of the meeting of Elizabeth and Mary from the Church of S. Giovanni fuor Civita, Pistoja, and the small figure in the Court of the Palazzo Vecchio, Florence. These, with the Baptistry Gates and numerous architectural casts, represent the School of Italian Renaissance comparatively well.

In the French and German Renaissance room the most important addition is Peter Vischer's King Arthur from the tomb of Maximilian, Innspruck. This noble figure quiet, dignified, yet full of energy, is the best of the mediæval bronzes. The tomb of the children of Charles VIII at Tours, is a charming work. There is a bust of Henry III, by Germain Pilon, the praying Madonna of Nuremberg, and a number of statuettes by Peter Vischer from the Sebaldskirche, Nuremberg. But this collection is meagre, and could, with advantage, be increased.

The last room has work of modern sculptors: a bas-relief of two children by Augustus St. Gaudens. One of the lions for the staircase of the new library by the younger St. Gaudens (probably should only be criticised as a sketch, but certainly has the paw awkwardly turned and lack of broad treatment in the mane, the head, however, is fine), two excellent busts and the interesting study for the Gallaudet statue by French. A good bust by Warner, groups by Dengler and an Aristotle by Mora ——. The remaining rooms on the first floor are the rooms for Egyptian, and for Greek, Roman and Etruscan antiquities.

The Way collection was the nucleus of the Egyptian department, and it has now been augmented by fragments from the Temple of Bubastis, of Hathor and of lotus capitals, and by several granite reliefs. The Egyptian Exploration Fund Society has made important additions to this department within the past three years, and it is now one of great interest.

The Greek, Roman and Etruscan antiquities are in cases, containing a fine collection of vases, terra-cottas and bronzes. Of these the case containing the figurines from Myrina, given by Mr. Brimmer, is one of the most interesting. These figurines are exquisitely modelled, and have great grace and delicacy.

The series of terra-cotta busts, obtained from Signor Lanciani, are also full of interest. There are also in this room the marble head of Apollo given by Herr Von Bulow, and a charming head found in Rome, given by a class of young ladies.

The last room has architectural fragments, Gothic and Moorish; from Lincoln Cathedral, and from the Alhambra and the Alcazar at Seville.

Ascending the staircase and turning at the landing, the first thing seen is the Victory of Samothrace upon a pedestal representing the prow of a trireme, a diminished suggestion of the actual pedestal to the statue. In the hall above are several modern pieces of sculpture, of which the latest is Falguière's "Diana," a wretched piece of modern French realism.

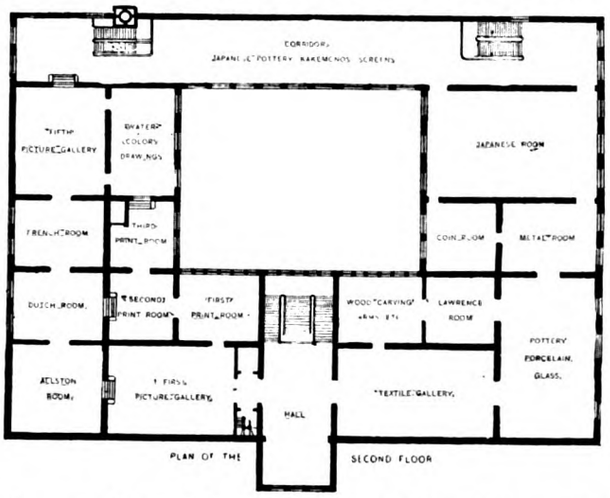
Turning into the picture-gallery, which is now filled with large canvasses, mostly by followers of the Venetian School and the French Classicists, two new pictures, however, are prominent, Turner's "Slave Ship," still as full of color as ever, and destroying everything near it; and opposite the "Marriage of St. Catharine," by Paolo Veronese, loaned by Mr. Quincy Shaw. This latter is a really fine Veronese, and at once assails both in color and drawing the integrity of the examples of the Venetian School about it. The altarpieces are interesting, but mediocre. The two pictures of the Spanish School which have been ascribed to Velasquez, and have a slight resemblance to the work of Spagnoletto, are perhaps the next best things in the gallery. The Bouchers are rather worse than usual with Boucher, the study for the Judith head by Vernet, is brutal, the Fragonard "Fountain of Love" is colorless and poor.

The Allston room is now entirely filled with the work of American painters, among whom Gilbert Stuart easily leads with a series of fine portraits. The Copleys are sadly disappointing, and the Pages, Newtons, Peales, Healys and Trumbulls are interesting archæologically.

The next room contains ten pictures of the San Donato collection, all interesting. The "Rabbi" of the Slater collection a very fine Rembrandt; a beautiful van der Weyden, "St. Luke Drawing the Portrait of the Madonna"; and a good Holbein.

The next room is the best of all the galleries. It contains examples of the Barbizon School: Corot, Millet, Diaz, Rousseau, Troyon, Daubigny and also several Coutures, a Jacque, a Delacroix, a Géricault, etc.

The finest of these are from the Slater collection. An exquisite Corot, "Nymphs and Fauns," is one of the best of his works; near



by is a very fine wood interior by Diaz, and there is a wonderful twilight in the woods, by Rousseau, that is a most remarkable piece of work.

The Delacroix "Columbus" is naive, it so frankly imitates Titian's "Presentation of St. Catharine." Altogether this room contains a very exceptional collection of fine paintings.

The last of the large picture galleries is filled with contemporaneous work of American arists, mostly Bostonians, with the exception of the east wall, on which are hung a fine Gérôme "L'Eminence Gris," a richly toned Meissonier "The Guard-room," four Coutures and Regnault's "Automedon"; opposite are Hunt's canvasses, disappointing as a whole, though with some masterful exceptions. Fuller's "Arethusa," Vedder's "Sea Serpent," Abbott Thayer's "Angel" and La Farge's "Magi" are the more important of the remaining works. The La Farge is full of color, and as usual, bodiless in drawing. The small Vedders are delightful bits of

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color. The smaller Gaugengigl holds its own besides the Meissonier above it. It has not the mellow tone of the Meissonier, but it has much more life and character, and is not a mere model study as the Meissonier certainly is. Other artists represented, and in nearly every case well represented, are Cole, Thomas Robinson, Johnston, Vinton, Inness, Thompson, Pearce, Picknell, Caliga, Henry Walker, Ritter, Bolton Jones, Allen, Enneking, Benson, Duveneck, Vonnoh, Tolman and Mrs. Whitman. The collection is not only representative, but it is sound, healthy work in most cases, and has a certain high impulse in it.

The water-color gallery has not at present a very remarkable collection, with the exception of two frames of Millet's sketches. Ross Turner's "Garden" is as attractive as ever and Rimmer's studies are very interesting. The etchings and engravings have been most attractively arranged by Mr. Köhler.

The long south gallery has at its east end a very beautiful collection of Italian and French decorated MSS. recently loaned to the Museum, and the remainder of the entire gallery is taken up on one side by Japanese Kakemonos (pictured scrolls) largely from the Fenellosa collection and on the other by Professor Morse's collection of Japanese pottery. Both of these collections are the most complete of their kind in existence and cannot be rivalled, as it is now impossible to collect similar works of equal merit in such large quantities. The Kakemonos number several hundred. Several of the richest of them bear a curious resemblance to the Giottos and Cimabues of Padua and the Benozzo Gozzoli frescoes in the Riccardi Palace in Florence. The Morse collection numbers approximately 4,000 pieces, of all shapes and colors and glazes, with each piece classified.

The next room contains a superb collection of Japanese works of art. Swords and guards, bronzes, lacquers, silks, armor; the larger proportion collected by Dr. William Sturgis Bigelow. This collection is to be supplemented by a still larger collection including several hundred Kakemonos, now on its way from Japan.

The metal room has its central case filled with the yachting cups won by General Paine, the technical work finely-done, and most of the designs extremely bad.

The remainder of the room is filled with metal work of all kinds, periods and nationalities. A Venetian wrought-iron door opens into a small adjoining room, the coin-room, which contains fac-similes from the British Museum of several hundred Greek coins and is to receive the Rindge collection, which is one of the largest of the private collection of coins.

The porcelain, glass and pottery rooms remain much as before with some few additions. The Cloisonné, Persian, Chinese dragons-blood and Japanese blue china cases are the finest. There are many fine tiles which put to shame the modern examples, and some very interesting and fine examples of modern dragons-blood vases.

The Lawrence Gallery, the Textile Gallery and the Wood-carving and Arms room have undergone very little change.

It will be seen from the foregoing that the Museum is not only of the utmost value to the student, especially in the Departments of Casts, of Japanese Art and of Painting, but that it is arranged in a most effective manner, giving an impression of thorough knowledge, and of dignity.

It is quite worthy now to be compared with Museums abroad, a fact which the Berlin Museum authorities recognize, by publishing regularly an account of its acquisitions in their reports. Certainly the Boston Museum of Fine Arts can now create an interest which should bring students from afar.

NOTES AND CLIPPINGS

A Corner in the Lath Market. — A curious consequence of the failure of the ice crop is a corner in the lath market. The small schooners that have heretofore been engaged in the bringing of laths to this market have all been engaged by the ice companies to bring ice from New England, and the stock of laths on hand having been consumed, a desperate shortage has resulted. The price of laths to arrive was yesterday quoted at $3 per thousand, a figure that laths have not reached for many years. — *New York Times.*

London's Tower Bridge. — Last week brought to a most satisfactory conclusion the construction of the two huge river piers embraced in Mr. Jackson's first contract for the Tower bridge over the Thames. The area covered by each of these piers, which are founded at a depth of sixty feet below high water, is, it is said, larger than that of any other bridge pier in the world, covering no less than 16,500 superficial feet. Active preparations are now going on for the erection of the steel superstructure by Messrs. William Arrol & Co. — *Pall Mall Gazette.*

Utilization of Walnut Logs. — It is stated that a practising attorney of Sella, Iowa, has made a large amount of money not only for himself, but for the Iowans, by buying up the stray walnut logs of the State and shipping them direct to Germany and England. Last year between 1,200 and 1,500 car-loads were shipped, nearly all picked up in Iowa. Few among the early settlers of the State ever dreamed of the value that walnut trees would possess, and that within a quarter or a half of a century after settlement. Thousands of fine trees were cut down, burned, or allowed to rot on the ground, or split up for old-fashioned rail-fences. Now buyers rummage every mile of territory in the State to find logs, and put them on the cars to be carried thousands of miles across the ocean to be worked up in fine furniture for the adornment of European palaces. — *New York Commercial Advertiser.*

India Rubber Paving. — A German engineer, Herr Busse, has made some experiments with India rubber pavement in the town of Linden, in Hanover. The first attempt was made on the carriage road over the Goethe Bridge, and the result was so favorable that the work was extended. Experiments are now being carried on in Berlin and Hamburg, and the results have been extremely satisfactory. India rubber is said to combine the hardness of the stone pavement with the elasticity of asphalt, but rubber pavement does not become so slippery as asphalt. Of other unusual materials for pavement it may be mentioned that, both in St. Petersburg and Constadt, cast-iron is used to a considerable extent for the pavement of streets, the surface being, of course, cast in such a manner as to give the horses a safe footing. — *Engineering and Mining Journal.*

TRADE SURVEYS

If manufacturing interests have adopted any peculiar line of policy this year in contradistinction to the polices of former years, it consists in the policy of contracting away ahead for raw material, or more or less finished products. An examination which has extended over some twenty odd industries, reveals the very interesting fact that the same policy of anticipation has been followed in each and every one. This is something new. In past years, manufacturers, builders and buyers of all kinds have been content to purchase what they wanted from time to time, in fact, any other course was never thought of nor suggested by then existing conditions. All conditions have changed within a few years, and the practice of arranging for supplies of all kinds for future requirements has become quite general. Whether we look at the iron industry, the lumber trade, the mining industry, the shoe-making industry or any industry, great or small, the same general policy of buying far ahead is being adopted and carried out. The occasion for this change is not easy to assign, but it is not difficult to foresee the advantage of it. It virtually fixes production and prices. It virtually saves the commercial community from those ups and downs which have characterized business in former years. It acts as a balance wheel, or rather as a governor, to guide on the one hand and to warn on the other. It introduces a new principal or rule of action into business. It adds an element of safety, of which modern commercial development stands much in need. It furnishes an element of security and protection which will make panics and depressions less frequent. It is simply one great step toward the organization of industries and business upon a more comprehensive, rational and enduring basis. This custom will become more and more general. The adoption of this method of doing business is destined to accomplish more to control and check and hinder the unjust operations of trusts than any other one thing that could be named. The reason for this assertion is, that the immediate purpose of trusts is to restrict on one hand and enhance on the other. The purpose of this policy of forward buying is not to restrict or enhance, but simply to secure to every buyer his requirements at fixed or fixable market values. In financial circles there is a renewal of that uncomfortable apprehension that constantly arises as to a sufficiency of currency for the business interests. The surplus reserves are again down to the water's edge. Good financial management can, of course, restore them; but let it be noted just here at what cost. The cost of that restoration of surplus is the greater or less deprivation of borrowers of money necessary to conduct business. It is in the power of a comparatively few men to bring shop men and farmers by the tens of thousands within scaring distance of the sheriff. That is just where hosts of them are now. More or less crude remedies have been suggested.

Agriculture has, perhaps, been unduly stimulated in the West, and this has resulted in a surplus of farm products that keeps prices very low. Supplies in farmers' hands, it is said, are beyond calculation. Manufacturers, on the other hand, bitterly complain that they are doing business at the narrowest margins ever known. Restrictions have already set in in several directions, notably among the anthracite miners, the Western wire nail-makers, among the ingrain carpet-makers, and in some lines of hardware. Possibly this restriction may be necessarily extended into other lines. The enormous amount of capacity which has been provided necessitates the question: "Where are markets to be found?" A balancing factor is wanted in our economic system; viz., the increasing, or the means of increasing, the consuming power of the individual. Recent railway returns show that the volume of business for February is 12 per cent over that of last year, and for the past two months the increase is 13 per cent. The exportation of wheat is attracting widespread attention, the increase of crop this year over last being 10,000,000 bushels. Foreign markets are likely to continue to absorb our surplus, which amounts, according to one authority, to 136,000,000 bushels, and, according to another, 156,000,000 bushels. During the present cotton season we have sent abroad over $200,000,000 worth of cotton, an increase of 18 per cent. over same time last year. The exportation of bread-stuffs, provisions, cotton and petroleum for February were $52,000,000 in value, an increase of $10,000,000 over the same month of last year. For eight months past, our increased exports of these products amounted to $76,000,000 worth. A glance at railroad earnings furnishes much encouragement. The published reports show that 149 roads, during February, earned $63,000,000 in round figures, as against 56,000,000 for same month of 1889, an increase of $7,000,000. The Southern roads have made the best record. The Southwest is coming up. The Pacific roads are doing well. Western provision-markets show great activity. The "Soo" Line is the thorn in the side of the Western railroad situation, and agreement seems to be impossible as long as that bush-whacker is loose. The general business situation continues healthful, and there are numerous evidences of activity in the near future. Eastern jobbers report excellent distribution. Western jobbing-houses are springing up nearer and nearer to the new markets. The mining interests of the Rocky Mountain region are expanding every month — a fact shown in the increasing demand for labor, machinery and facilities for smelting and utilizing the mineral products of the region. Every sound from the South betokens greater industrial activity. The possibilities of developing a profitable export trade between Gulf and South Atlantic ports, with Central and South America, are leading to the projection of a good many ship-building enterprises, which railroad companies are asked to help forward.

S. J. Parkhill & Co., Printers, Boston.

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swept past them, carrying away the civilization of the ancient world, and with it the art of fortification as it had been developed by the experience of ages.

GALLO-ROMAN PERIOD.

During the struggles of the dying old world and of triumphant barbarism, which was poorly protected by Roman weapons, every city turned its attention to its own defences. The noblest monuments were levelled to the ground to furnish material for fortifications; in these hastily constructed walls quantities of sculptured fragments and shafts of columns are found (Figure 10).

[To be continued.]

THE ROYAL POLYTECHNICUM AT MUNICH. — ITS CURRICULUM. — THE COST OF TUITION. — THE CORPS OF PROFESSORS.

IN Germany the higher institutions of learning are divided into two classes, the universities and the polytechnicums. The latter class, in which the Royal Polytechnicum, at Munich, holds high rank — covers the usual technical courses, mining, mechanical and civil engineering, chemistry, architecture, etc., and are placed on a level with the universities. Its students enjoy the same privileges — free admission to the galleries, collections, museums; reduced admission to the theatres and the use of the libraries of the State. The completion of a regular course, also leads to a doctor's degree, but only after a special examination covering all the work of the previous years has been passed with a sufficient degree of merit, besides the term-examinations and those at the end of the second year. The course requires four years of study, but even the *gymnasium* student, with his excellent preparation, is advised to extend it through five years. I need not dwell upon the facts that attendance, examinations and the following of a prescribed course are at the option of the individual and also that baccalaureate degrees are not granted.

The course in architecture as printed in the prospectus of the Munich institute for the School-year 1889-90 is as follows:

FIRST YEAR.

FIRST TERM.	Lectures, Recitations, Exercises, etc.		SECOND TERM.	Lectures. Recitations, Exercises, etc.	
Higher mathematics	4	2	Higher mathematics	4	2
Descriptive geometry	4	4	Descriptive geometry	4	4
Physics	6		Physics	4	
Construction	1	4	Construction	1	4
Elements of ancient architecture	1	4	Elements of ancient architecture	1	6
Shades and shadows	1	2	History of the fine arts	4	
History of the fine arts	4		Freehand drawing		4
Freehand drawing		4			

SECOND YEAR.

General chemistry	5		Mechanics (as particularly applied to architecture)	2	
Mechanics and graphical statics	7		Construction	3	6
Construction	3	6	Materials	2	
Materials	3		Ancient architectural history	3	
Ancient architectural history	2		Elements of Mediæval architecture	2	4
Elements of Mediæval architecture	2	4	Elements of Renaissance architecture	1	4
Elements of Renaissance architecture	1	4	Linear perspective	1	2
Freehand drawing and from the antique		4	Freehand drawing and from the antique		4

THIRD YEAR.

Stereotomy and stone-cutting	5	2	Stone-cutting		4
Heating and ventilation	3		Heating and ventilation	2	
Planning of public buildings	4	8	Planning of public buildings	4	8
Mediæval architecture (designing)		4	Mediæval arch. (designing)		4
Elements of Renaissance architecture		2	Elements of Renaissance architecture		2
Perspective	1	4	Perspective	1	2
Freehand drawing		4	Tunneling, road-building, etc.	4	
Modelling		4	Freehand drawing		4
			Modelling		4

FOURTH YEAR.

Designing (Renaissance)		14	The style of the Renaissance	2	
Designing (Gothic and Romanesque)		4	Designing (Renaissance)		14
Decoration	1	4	Designing (Gothic and Romanesque)		4
Æsthetics	1		Decoration	1	4
Machinery (a consideration of the mechanical appliances an architect has to deal with)	3		Estimates	2	
Building-laws	3		Railroad engineering	1	
Freehand drawing		4	Sanitary engineering	5	
Modelling		4	Freehand drawing		4
			Modelling		4

In the outline of the course given above, the numbers following each subject respectively indicate the hours of lecture and practice-work devoted to it weekly. Instruction is much aided by the large collection of plaster-casts, photographs and other facilities at the command of the professor, which in each department are provided with full consideration of the requirements of those who are to use them. Not only can access be obtained to such property as may belong to the Institute itself, but also to the large collections of the State which are centred at Munich, the acknowledged art-centre of the empire, notable among which are the Glyptothek (devoted to sculpture and containing the groups from the pediments of the temple at Ægina, restored by Thorwaldsen — a treasure, and an important link in the history of Greek sculpture); the old Pinakothek (old masters); the new Pinakothek (masters of modern painting); Museum of Industrial Art; collection of vases, the National Museum (fine collection of old furniture, wrought-iron work, etc.), not to dwell upon the ethnographical, zoological, paleontological, mineralogical collections, which, although of no particular interest to the architect, yet serve to give Munich the position it holds. I may also mention the library which contains one and a quarter million volumes and the small, but well-chosen library of the Polytechnicum. By "elements of ancient architecture," etc., in the schedule above is meant a study of the details and characteristic points which tend to make up a style. These are first considered — the student copies mouldings, carvings, parts of buildings, etc., and finally whole buildings; then the subject is treated historically, its best examples are brought to his notice and descriptions are entered into. After this training he is supposed to be capable of designing in that style and problems are given him accordingly.

The school-year is divided into two *semesters*. The winter *semester* lasting from the fifteenth of October until the fifteenth of March; then after a vacation of about a month the summer *semester* begins and continues until the fifteenth day of August.

Should the architectural student find time lying heavily upon his hands, with an average of fifteen hours in the lecture-room and twenty-five per week in the draughting-room, he can join several other courses, the pursuance of which will prove beneficial to him in his future career: to wit, water-coloring, photography, stenography, lectures on ornament, a systematic study of the paintings in the old and new Pinakothek (under F. v. Reber), seminary work at the National Museum (Professor Graf), and English, French and Italian. The absence of any modern language in the course may be traced to the fact that the German youth after having completed his preparatory education, and before entering the University, has a pretty fair knowledge of English as well as French.

Much has been written of the customs at the great German universities at Heidelberg and elsewhere. Suffice it to say that such information may be applied here. Technical schools have their *corps; corps* have their beer-drinking members, and the beer-drinking members have their small caps and big beer-drinking dogs, as well as the universities.

Were I in the field as a future *savant* it would be a source of gratification to me to see what a respectful attitude is preserved towards the members of the faculty. And it seems but just that the efforts of men who devote their lives to a pursuit, success in which is not attended with the usual reward and distinction gained in other walks of life, should, at least, be acknowledged.

Lectures usually last forty-five minutes and end with the hour. At the instant the hands of the clock, which is in every room, indicate the quarter passed the professor appears, bowing in all directions to the class which has risen to greet him. With his appearance all noise has ceased, and when he reaches the platform to make his final bow, the class seats itself and the professor proceeds without interruption until the clock indicates the close of the hour. The class again rises as the professor leaves the room and then disperses.

It is needless to say to all who know anything of the German character that all such boyish pranks as are indulged in in the French schools, and everything of that class, which he puts down as being *ohne sinn*, finds no foothold here. On the contrary, silence and quiet reign supreme in a German draughting-room. This may be one of the good results of non-compulsory attendance. Who can tell! But certain it is, that the student who does not like to see military or primary school discipline brought into a university and acts accordingly, is not haunted by a phantom in the shape of a small black letter — ordinarily innocent enough in its aspect, but when neatly marked on a term's report seems quite terrible — which all subsequent study and a good examination cannot prevent. His daily presence may be a gratifying sight even to the German professor, but it is not the only "open sesame" to an honorable completion of a course.

The charges are based upon the number of hours taken weekly. The privilege of attending a lecture is paid for at the rate of two marks and one-half (60 cents) per term; laboratory and draughting-room work at the rate of one mark and one-half (36 cents.) A matriculation-fee of ten marks is required, and also three marks per term for the sick-fund. Should a student be taken ill during his course, he is given a private-room at the hospital and excellently cared for. He himself must pay a nominal sum, I think amounting to twenty-five cents a day, the remainder of the expenses incurred being paid out of the fund's treasury.

Among the names of those connected with the architectural

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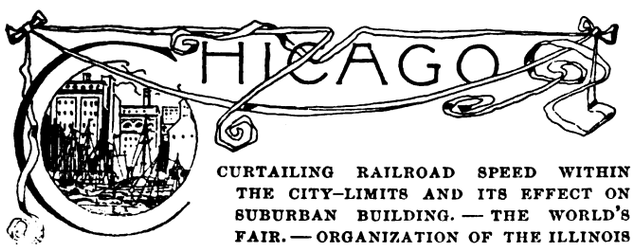
faculty at Munich, we see those of F. v. Reber, Jos. Bühlmann, Fried. and Aug. Thiersch, A. Geul, Freiherr v. Schmidt, Dr. Wm. Wittmann, Dr. H. Graf, G. v. Bezold and others.

Other institutes of technology are to be found at Aix-la-Chapelle, Berlin, Darmstadt, Brunswick, Stuttgart, Dresden, Hannover and Karlsruhe, whose courses do not materially differ from the one here.

Although, as already stated, attendance is not obligatory, the student must register for at least twelve hours weekly. In summing up the number of hours, three hours of draughting may be taken as equalling two in the lecture-room.

Before you can enjoy all the privileges of the student and are duly considered a member of the school, and after you have presented your diploma and have paid all your fees, there is still another form to comply with, that of introducing yourself to the Director. From him you receive a copy of the rules of the institution, which you are supposed to read, but usually do not. You then place your name in the register; you are now fit to shake hands with the Director, who, with a few words of congratulation, bows you out of the room. At last you can breath easily. Now you are free, unmolested you can attend to your studies for years and years, until you choose to take an examination. These are thoughts which pass through your mind, and for a moment your bosom swells with praise, as you see within your grasp hidden treasures of knowledge which are soon to be yours. But the moment passes, just soon enough, to be brought back to the realties of life by the I-should-like-a-*pour-boire* look on the countenance of the attendant who helps you on with your overcoat. Apropos, I have often thought that the life of an attendant or a waiter must be a most exciting and a happy one. What is the pleasure of the gaming-table, where it is either win or lose, or the anxiety of the player as he eagerly watches the revolving wheel, compared with that of the waiter as he looks from aloof upon the victim, who is his game of chance, who is the dame fortune which never brings him losses but only gain or naught? And what interesting factors enter into the problems on the theory of probabilities with which he deals!

THEO. F. LAIST.



CURTAILING RAILROAD SPEED WITHIN THE CITY-LIMITS AND ITS EFFECT ON SUBURBAN BUILDING. — THE WORLD'S FAIR. — ORGANIZATION OF THE ILLINOIS CHAPTER, A. I. A. — THE SPRING EXHIBITION AT THE ART INSTITUTE.

ALTHOUGH the recent growth of the suburbs has been so remarkable, just at present those interested in them are much exercised over a question that the railway companies are agitating in regard to the rate of speed of trains running within the city-limits. Since the last spring election the city proper extends out onto the limitless prairies, and now includes many villages which were heretofore considered strictly suburban towns. A city ordinance provides that the speed of trains within the limits shall be only ten miles an hour. Up to the present time this ordinance has never been lived up to. There is killed, on the tracks entering the city, one man a day on an average, and as the trains are not run at the rate prescribed by law, the damages assessed to the railroads are much heavier than they would otherwise be. Thus the matter stands; the railway companies say they will conform to the law until the city fathers see fit to change the ordinance, and between these two august bodies the feeble suburbanite seems fated to suffer. As it will take an hour and one-half to come from towns, from which the running time was formerly three-quarters of an hour, the indications are, that the growth which usually comes to the outside districts each spring, will this year be much retarded, and building in the suburbs come to a temporary standstill. Of course, it will not be lasting, and it looks now as if the question of rapid transit for the suburbanites would be settled within the next few years. Some of the roads have offered to build viaducts at every third street, provided the city will arrange for the two intervening ones. Some of the roads advise walling-in the tracks, some sinking them, but nothing is settled except the fact that hundreds of trains bearing thousands of busy men and women, impatient to reach or leave their places of business, will creep in and out of the town every morning and night.

The means of rapid transit to the remote parts of the city are, however, being increased, and this will naturally lead to building in the new districts. The cable-cars, maligned and abused as they constantly are by their patrons, do bring people into the heart of the town from the northern and southern limits much more rapidly than did the old-time horse-cars. There is much talk, and some activity, on the elevated-road subject. The West Lake Street road is already in process of construction, and the charter for the West Randolph Street one has been granted. Both of these roads, when completed, will open-up as desirable residence-quarters large tracts of land on the West Side, which have hitherto been considered too remote from business centres to be available. There has been for some time much vague talk of an elevated road for the South Side, to be carried down through the continuous alley which runs between Wabash Avenue and State Street. Should both of these sections of the city obtain elevated roads, the North Side would not be long in following their example. These contemplated changes make desirable sites for dwellings uncertain things, and the continued good character of a neighborhood doubtful. The city is fast outgrowing its old accommodations: the dangerous tendency seems to be to give it larger ones than it really can fill, and so tax its strength too much, forgetting that it is "large for its age." The certainty of the World's Fair being held here of course helps along the feeling that more extensive accommodations, at least, must be gained before 1892, to permit the successful entertainment of a large number of guests.

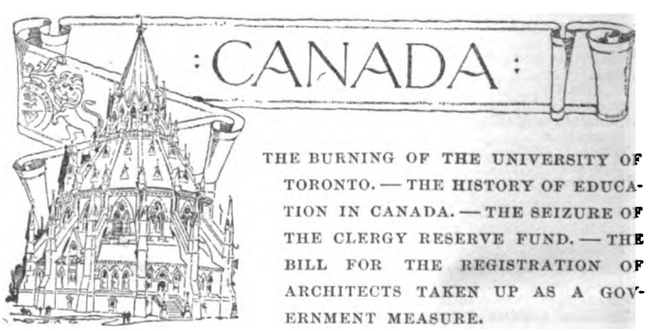
Nothing is as yet decided about the site of the Fair, though the *pros* and *cons* of the different localities are being vigorously discussed. Various committees are being appointed and different World Fair companies are being incorporated. The predictions in our previous letters we now see fulfilled, and the enthusiastic desire to obtain the Fair for our city is only equalled by the zeal with which the actual work of the enterprise is being undertaken.

During the past month the consolidation of the Chicago Chapter of the American Institute and the Illinois Chapter of the Western Association has been accomplished, though all the details have not yet been realized. The Chapter will be known as the Illinois Chapter of the American Institute, instead of the Chicago Chapter. It was considered wise to take the more comprehensive name, in case there should ever be any occasion hereafter for legislation on subjects pertaining to the profession. The articles of incorporation have already been taken out under this name.

The Constitution has not been finally adopted, and, consequently, the obtaining of the charter from the American Institute has been delayed. It was considered advisable to have the Constitution printed and distributed among the members, that more thought could be given to it than in an informal discussion. The Constitution, as reported, is framed more on the model of that belonging to the Illinois Chapter of the Western Association than on the one of the old Chicago Chapter of the Institute, with the exception that the Executive Committee is composed of the officers, rather than of a board made up of members of the Association. The special subject for discussion is that concerning honorary members, some being in favor of granting them all the privileges of active members, and some being opposed to doing so. According to the proposed Constitution, members of the Chapter must, at the expiration of two years, become members of the Institute or resign from the Association.

Heretofore the Chapter of the Western Association has formed a decided contrast to that of the Institute in the amount of work accomplished by it. The former has been active in all measures which would be of benefit to the profession, and, in fact, generally alive to all architectural interests. The latter association has been more noted for lack of interest, except in such matters as pertained to the flesh-pots of their occasional dinners. It is now intended to infuse some of the spirit of the old Illinois Chapter into the new one, and make it a power working for good results in this section of the country.

The Art Institute is at present holding its annual spring exhibition, which, with the neighboring collection of the Verestchagin pictures and the "Angelus," make a group well worth seeing. The building of the Art Institute has been enlarged and remodelled this winter, and now throws open for the first time its new galleries. The changes are too extensive to be dwelt upon in this letter.



THE BURNING OF THE UNIVERSITY OF TORONTO. — THE HISTORY OF EDUCATION IN CANADA. — THE SEIZURE OF THE CLERGY RESERVE FUND. — THE BILL FOR THE REGISTRATION OF ARCHITECTS TAKEN UP AS A GOVERNMENT MEASURE.

THE destruction of the University of Toronto by fire on the evening of February 14th last has been more than a "nine days wonder" and topic of conversation, for it was nothing less than a national calamity, and although it has been somewhat fully written about in the daily press, such a subject deserves special recognition in architectural journals, if only for the sake of placing the matter on record. But in this case there is a deeper interest awakened: a university is an important vertebra in the backbone of a country, an important wheel in the machinery of its progress; every country that possesses a university cannot but feel deeply for this loss to Canada, and many have been the letters of sympathy received by the authorities from sister institutions. Like a very large proportion of fires the cause was carelessness, and in this case carelessness

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of a most unwarrantable character, such as should, indeed, be made criminal. One hears often of miners sitting and smoking on kegs of gunpowder, and it is hardly less foolhardy to carry a tray full of *lighted* coal-oil lamps. If they had not been lighted, possibly the fellow carrying them would not have stumbled, but as they were he had to use more caution, and that very fact made him trip. Instantly there was a blaze, and in less than half an hour one wing of the building was enveloped in flame, a steady wind converted a little fire into a "burning, fiery furnace," and the meagre supply of water was totally insufficient to cope with it. I have seen a good many great fires, but I never saw a fiercer. Convocation Hall stands north and south, attached to the rest of the University at its south end but standing clear of all buildings otherwise. The wind was from the northwest and swept through the window openings, blowing out the flames through the windows of the east side *horizontally* for ten feet at least, and, as the stonework calcined, the walls were honeycombed with flame, the stones appearing set in a network of flame. The whole hall inside was a mass of furious flame, no smoke being below the eaves-line.

Blame for the lack of water can only lie with the University authorities themselves. The building stands in grounds of its own, therefore any mains in it could be only private property; the city had no power to deal with the matter. Of course additional mains and increase of protective arrangements were "in course of contemplation," but the stage of action had not been reached. A curious incident, showing just how far the fire and heat went and then stopped, is related. In a vault was a package of money in bills lying near one of the walls, the outside bill had its outside face so charred and scorched as to be unrecognizable, but the back was good, and the bill was accepted by the bank.

The University was always considered one of the finest buildings of Toronto, if, indeed, it did not take the first place, and certainly at the time of its erection there was no building in the Dominion to hold a candle to it. It was built from the designs of Messrs. Cumberland & Storm, architects, of Toronto, in the round-arched or "Norman" style of Gothic. Mr. Cumberland has long since been "resting from his labors," but Mr. Storm, who is also President of the Ontario Association of Architects, still practises in Toronto. When the work of the building was first commenced in 1856, bricks were to be purchased at $4.50 per thousand, and one of our worthy aldermen recalls the fact that at that time he was a teamster and employed in carting these bricks. Stone was the principal material, however, from Georgetown, with dressings of Ohio, and internal corbels, caps, and so on of Caen stone. The building was completed in June, 1860, having taken just under four years in erection at a cost of a trifle under $360,000. Such a building erected now would cost nearly double the sum, but, happily, the foundations are intact and part of the building, and it is thought that a sum of $250,000 would restore the building to its former condition. The insurance amounted to $90,000, and the Provincial Government have voted $160,000 to make up the amount. So much for the building, but there is the library to be replaced, the rooms to be furnished, and for these purposes a further sum of nearly $200,000 must be raised by subscriptions. The city of Toronto intends to give $50,000, and the rest will, no doubt, be forthcoming before long. The library was valued at $150,000 and insured for $50,000, so there is a clear loss there of $100,000. The Government, in giving their contribution suggest that all speed should be used in the reconstruction, that, if possible, it may be reopened by the first of October next.

The history of education in Canada is a long chapter of vehement contention, and, for the exhibition of strong feeling and violent animosities, this subject compares well with other bones of contention that have from time to time stirred up the country. The present University has superseded the old King's College, which was an endowed institution, with its Chair of Theology and its regular morning and evening services, just like the colleges of English university towns. But Dr. Egerton Rierson, whose name passes down to posterity as the founder of the educational system of Canada, spent all his life trying to bring about a change in this system. The result was that the University College was founded without a chair of theology, and no services were to be held in the buildings. It was to be an institution for secular education entirely. But the great cause for ill-feeling and dispute was the manner by which the money for this building and educational purposes throughout the province was obtained. It was none other than the seizure of the "Clergy Reserve Fund." Up to this time the public education had been in the hands of corporations, or even private individuals, assisted by small Government grants and public subscriptions. In this move the Government took possession, and have since had entire control of the subject, and the education-tax upon all lands forms really the heaviest burden to be borne by the freeholders. As an instance of the principle of taxation for this purpose, I may mention the remark of an old gentleman the other day. He said: "Look at my land up in the Northwest; well, I don't suppose there's a child within fifty miles of it, but, nevertheless, I have to pay the tax." The seizure of the "Clergy Reserve Fund" meant the application of tithes which had hitherto been used for the support of the various rectories to secular purposes, and, this being the case, numerous rectories had to be suppressed, as there were no funds to support them. A certain number were provided for "forever." This was all brought about in the interest and for the benefit of the various sects and denominations, who could not, of course, approve of the principle of the Clergy Reserve Fund, whereby only Protestant (or Church of England, rather) ministers were supported. Trinity College, Toronto, was another outcome of this movement. Subscriptions were raised in the province and in the old country, whereby this theological college was provided in the place of the superseded King's. A remark was made (after the passing of the Act of Parliament on the subject) by an eminent Queen's Counsellor of Toronto, now living, to Dr. Rierson, on the occasion of a discussion which resulted in the decision that even "prayers" were not to be read in the building, that is rather amusing. The Queen's Counsellor said to Dr. Rierson: "Now you have got a godless institution." "Oh, dear! no," said Dr. Rierson, "our Act of Parliament specially says it is not so"; the statement of the Act being sufficient, apparently, to the Doctor's mind, to make up for the absence of all religious observances.

There is not much doubt now as to the result of the efforts of the Ontario Association of Architects to obtain legislation in the interest of the public and themselves. The Provincial Government considers the matter of such vital importance to the public that their houses should be carried out under the direction of competent men, and that all buildings of every kind should be properly constructed and supervised, that they have taken it up, made it a Government measure, and this practically insures its passage this session. Did ever any country or part of a country enjoy such an enlightened government? But it is too soon to remark here upon the clauses of the Act; when it has passed will be time enough. There may be some alterations; anyhow, by the time this letter is published it will have gone a long way towards becoming law. Of course, the one misfortune to the public is that every one now practising as an "architect," whether competent or incompetent, is entitled to registration under the Act, and it must be some time before the public are sufficiently awakened to recognize the competent from him who loudly boasts that he is competent; and, therefore, to the many foolish sheep who go after this hireling, there may be years of trouble and regret. But such is nature: every one must buy his own experience, and if he thinks that the loudest howler must consequently be the best architect, why all one can say is: "The more fool he!" Some trifling opposition has been offered to the bill, but it is of a character hardly likely to carry weight. It is fathered by some practitioners who think themselves above "associations," and do not like the idea of having to conform to laws. Such men, in fact, who like to be free to say and do what they like, to gull the public to their heart's content, to do any dirty trick so long as they get enough to live on, are not likely to approve the Act. But every honest architect has the success of the bill at heart, and when it is considered that no less than ninety-three per cent of all the architects practising in the Province are in favor of the bill, the character of those *not* in favor of it can be pretty accurately gauged. Such an Act should have been brought up by the public rather than the profession, but, since the profession has shown the public what is necessary for their safeguarding, and how the ranks of qualified men are sullied by here and there a "blackleg," they begin to see that they need some protection against these wolves in architects' clothing.

QUARREL BETWEEN THE PRESIDENT OF THE NEW SOUTH WALES INSTITUTE OF ARCHITECTS AND ITS MEMBERS. — COLLAPSE OF AN OLD HOTEL. — CENTENNIAL HALL.

SYDNEY, N. S. W.

THE New South Wales Institute of Architects, after a struggling existence of nearly twenty years, has fallen on evil days. An unseemly quarrel has taken place between the President, Mr. Hunt, and several Fellows, who considered that they themselves had been personally insulted, and the Institute generally placed in a false position by Mr. Hunt's mistaken ideas of government, which they characterized as "tyrannical and dictatorial." A special general meeting of the Institute was convened, at which some personalities were exchanged, and a formal motion, expressing want of confidence in the present management of affairs by Mr. Hunt, was moved, and would certainly have been carried by a large majority, if the President had not adopted the extraordinary course of declaring the discussion adjourned for a month. This, of course, only tended to make matters worse, and the meeting broke up in disorder. To still further complicate the proceedings, the gentleman from whom the Institute Rooms are leased suddenly took possession of the furniture, books, papers, etc., and announced his intention of holding them until his claim for rent was satisfied. And here the humiliating episode ends — for the present. The sequel must soon come, however; for if Mr. Hunt persists in retaining his present position, he will find himself ruling over an Institute which exists only in name. Without going into particulars regarding the various causes which have led to this rupture, it may be confidently asserted that the President has

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succeeded in alienating the sympathies of the very men in the profession, without whose assistance the Institute could not exist. At the same time his errors have been purely errors of judgment; he is an undoubtedly able architect, and an extremely energetic man, and even his enemies admit that he has throughout acted with the best possible intentions; but the results have been decidedly unfortunate, both for him and for the Institute.

Another large hotel — The Métropôle — was opened here a few days ago. The building itself, to which I have alluded in a former letter, is extensive and commonplace, though I believe the internal arrangements are excellent; and the bedrooms of which there are 250, are all well-lighted and ventilated. The amount of the contract for the erection was £80,000, and the furnishing, etc., is said to have cost another £70,000. The building is, of course, fireproof; but so, I believe, were several of those destroyed recently in the Boston fire, of which we have as yet received only some meagre cable information.

The choir portion of St. Mary's Roman Catholic Cathedral has just been completed, and is to be opened with imposing ceremonies on Sunday next, January 26, which will be the 102d anniversary of the foundation of the Colony. This reminds me that a building in Lower George Street, which is supposed to have been built in the beginning of the present century, and which has long been used as an hotel, fell suddenly a short time ago, and buried two persons in the ruins. No particular cause can be assigned for the collapse. A heavy thunderstorm was passing over the city, and, after an exceptionally heavy peal, the building cracked and groaned, and without further warning, bricks and falling timbers rained about the ears of the astonished inmates, who, with the exception of the ill-fated two who perished,

The Centennial Hall.

managed to escape into the street, just as their late abode became a shapeless mass of débris. The structure seems to have failed in much the same way as the wonderful vehicle described by the "Autocrat of the Breakfast Table," which "ran a hundred years to a day," and then suddenly resolved itself into a miscellaneous heap of firewood and old iron. The subject of the Sydney catastrophe was situated near the wharves, and on the night previous to the accident no fewer than 136 sailors are said to have slept in the ill-fated building! A sailor's luck is proverbial; but on this occasion "the sweet little cherub" who is understood to look after the interests of all sea-farers, must have been especially watchful.

The Australian Association for the Advancement of Science (founded on the lines of the well-known British Association) held its Second Annual Session in Melbourne last week. Among many papers, interesting and otherwise, there was one on "The Laying-out of Towns" by Mr. John Sulman, F. R. I. B. A., who is at present practising his profession in Sydney. He objects to the rectangular, chess-board pattern common to Australian towns, and recommends a system which shall "resemble that marvel of ingenuity a spider's web, than which nothing can be better devised for rapid access to all parts of its surface. Immediately around the central nucleus," which Mr. Sulman suggests, should be the Town Hall — "the business quarters would be located, while retail trade would naturally extend for some distance along the main arteries of traffic; and farther out, as the spaces between the main lines become wider, the residential quarters would find their place. But these should not be extended too far, without a break, and if the admirable example of Adelaide (South Australia) could be followed, by introducing a belt of park lands, the gain to the health of the town or city would be great. Beyond this belt of open ground, as the town increased in size, suburbs would naturally spring up, and these according to local conditions would naturally sub-divide themselves into residential or manufacturing. One of the latter should, in all cases, be restricted to the use of noxious trades." Æsthetically considered, Mr. Sulman is certainly right; and as to the utility of the scheme, perhaps some reader in Indiana can furnish information, for I am told that Indianapolis practically embodies in its planning the system herein advocated.

Since my last letter the Centennial Hall has been opened with great pomp and ceremony, and a lavish expenditure on the part of the Mayor. This hall is, correctly speaking, the Town-hall proper, but for many years we have been accustomed to speak of the existing building by that name, though it consisted only of the necessary offices and the vestibule. Some distinction was, therefore, deemed necessary, and the new hall was accordingly dubbed "Centennial" for no better reason than that the Council intended that the opening should take place in the Centennial year, viz., 1888. This intention was, however, frustrated by the builders; and the title is, therefore, if only for this reason, a misnomer, even when the absurdity of applying the term to a building is set aside. "Centennial Hall" it is, however, and Centennial it is likely to remain; the name is euphonious, and the meaning is of only secondary importance.

The hall itself was designed by Mr. T. H. Sapsford, the late City Architect, who died, however, before the work had proceeded very far. He was succeeded by Mr. George M'Rae, under whose supervision it has been finally completed in spite of many difficulties and much official interference.

Externally the building, though wanting in breadth and simplicity of treatment, is remarkably effective. The architects, certainly, were very heavily handicapped in being compelled to keep their portion of the work in harmony with the existing structure, while, at the same time, discarding its atrociously bad detail and excess of ornament. As a consequence the result is not altogether happy, for the new building has a strongly marked individuality, and it appears ashamed of its inability to impart any of its own dignity to the characterless and insipid construction to which it has been attached. This want of unity is unpleasantly apparent, and greatly mars the general effect.

Internally the hall is still incomplete, for the great organ, described in a former letter, is not yet in position, and the painted decorations of walls and ceiling are not begun, but good proportions and excellent detail create, on the whole, a decidedly favorable impression. The camber of the iron girders in the ceiling is, however, too noticeable, and destroys that appearance of flatness which is naturally expected, and the exaggerated size of the various mouldings causes the hall to look considerably smaller than it is represented to be. This defect, however, seems inseparable from most Renaissance interiors, from St. Peter's downwards; and the whiteness of the Keen's cement, with which the walls are finished, rather emphasizes, perhaps, the fault in the Sydney instance.

The ceiling is divided into bays by moulded and panelled ribs, and the central panel in each bay is dome-shaped, with radiating flutings. These domes are utilized for lighting purposes, and for getting rid of the vitiated air. The whole of the ceiling-surface — about 2,500 square yards — has been constructed in embossed zinc, screwed together and afterwards soldered. The only drawback to this otherwise excellent ceiling, to my mind, is that a great volume of sound may produce a certain amount of vibration which will interfere seriously with the acoustic properties of the hall. There is a considerable echo at present, bnt this may be caused by the empty space which is presently to be occupied by the organ, or it may be attributable to some other source; but it does not seem altogether improbable to suppose that the resonance of the metal may have something to do with it.

The following table shows the dimensions of the Centennial Hall, in comparison with those of other large halls — used for similar purposes — in various parts of the world:

DIMENSIONS OF HALL.

Name of Hall.	Length. Feet.	Width. Feet.	Sup. Area. Feet.
Centennial Hall, Sydney	166½	85	14,110
Town Hall, Preston	147	95	13,965
Public Hall, Glasgow	185	75	13,875
Philharmonic Hall, Liverpool	135	102	13,770
St. George's Hall, Liverpool	169	75	12,675
St. George's Hall, Bradford	152	76	11,552
Surrey Music Hall	152	76	11,552
Melbourne Town Hall	147	72	10,584
Free Trade Hall, Manchester	135	78	10,530
Exeter Hall, London	133	77	10,241
City Hall, Chicago	150	64	9,600
St. Martin's Hall, London	121.6	71	8,626
Birmingham Town Hall	130	65	8,450
Barnsley Town Hall	144	58	8,352
St. James's Hall, London	136	60	8,160
Paisley Town Hall	136	60	7,800
Devonport Town Hall	100	67	6,900
Bolton Town Hall	120	56	6,272
Salter's Hall, Droitwich	100	60	6,700
Public Hall, Southport	112	50	6,000
Reading Town Hall	97	60	5,820
Hastings Town Hall	100	58	5,800
Chorley Town Hall	100	58	5,800
Blackburn Town Hall	114	50	5,700
Middlesborough Public Hall	100	56	5,600
Manchester Town Hall	100	50	5,000
Public Hall, Ramsgate	112	41	4,592
St. Helen's Town Hall	96	45	4,320
Public Hall, Todmorden	96.9	44.6	4,305
Battersea Town Hall	106	40	4,240
Kensington Town Hall	80	52.9	4,220

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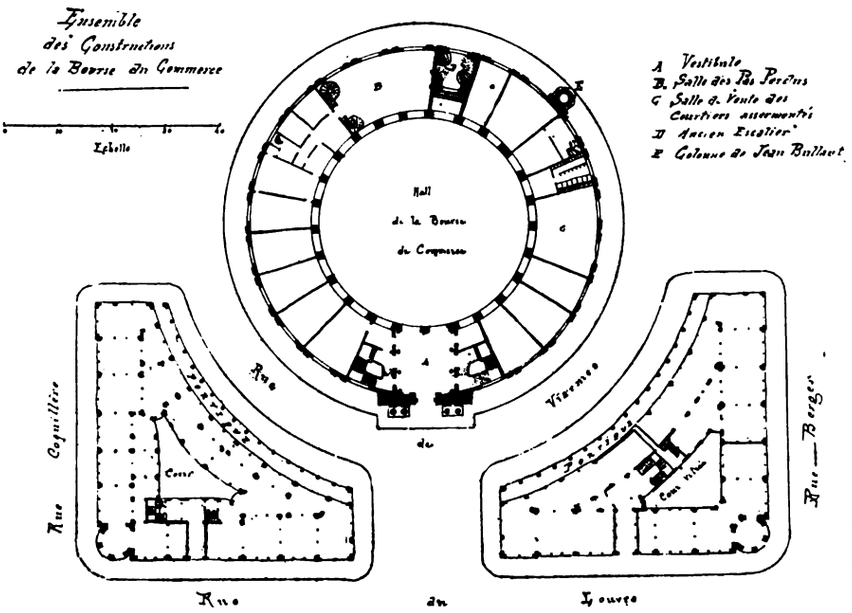
"The Eolus Water-spray" system has been adopted in connection with the ventilation of this hall, and seems to act perfectly.

PARIS.

THE NEW BOURSE DU COMMERCE. — THE ANCIENT HALLE AU BLÉ. — THE DECORATIVE PAINTINGS ON THE DOME.

THE Quartier des Halles, formerly consisting of narrow streets, old and dirty, is in the way of being completely transfigured, and it is already traversed by large streets bordered by fine new buildings. Two new and important structures have contributed toward the absolute transformation of the physiognomy of this quarter: the post-office, which we have already spoken of, and the Bourse du Commerce, lately opened. On the site of this edifice was erected, in the thirteenth century, the Hôtel de Nesle, later the palace of Catherine de' Medici; again later, it became the Hôtel de Soissons. This was destroyed in 1763 to make room for the Halle au Blé. The present Bourse du Commerce retains some reminders of these different structures. Of the palace which Jean Bullant built about 1572 rises a last vestige: this is the astronomical column of Catherine de' Medici, which is 26 metres high, and was formerly enclosed in the circular façade of the Halle aux Farines, which M. Le Camus de Mezières built in 1762 in concert with M. De Viarmes, provost of the merchants, and the writer Oblin. Originally, this hall was not covered. It was only in 1782 that they built a first dome of wood, which was destroyed by fire October 16, 1802. In 1810 the architect, Joseph Belanger, conceived the idea of covering the rotunda of the Halle au Blé, which has a superficial area of about 1,200 metres, with a dome of iron and copper — a feat which was considered an extraordinarily bold one for that time, when builders did not have at their disposal the perfected apparatus of to-day. All the pieces had to be wrought out with the hammer, and united together leaf by leaf. This framework has been preserved. The copper was taken off and replaced with glass, to give more light and air to the present rotunda.



In 1880, the Central Committee of the Chambres Syndicales of Paris presented to the Municipal Council a petition begging that Paris, like Lyons, Marseilles, Bordeaux, Le Havre, Rouen and Lille, might have the benefit of an official Bourse du Commerce. The Council was favorably inclined, and several projects were presented wherein the ancient Halle au Blé was utilized, with enlargements and an opening-up of its approaches. After three years' discussion and conference, it was decided that the City of Paris should concede for sixty years to M. Blondel, architect, the Halle au Blé and a zone of territory measuring about 2,630 metres, divided into two islands, as it were. For his part, the *concessionnaire* engaged to transform the Halle au Blé into a Bourse du Commerce and to erect on these two "islands" two annexes, within eighteen months at most; besides, for sixty years he agrees to pay an annual rent of 300,000 francs. The hall will be free; the offices in the Bourse itself will be let at twelve to fifteen hundred francs a year, according to the tariff which has been arranged by the Council in consultation with the Chamber of Commerce, and the latter body will take charge of the leasing and administration of the building.

Such, in a general way, is the work which has lately been finished, and which has necessitated the expropriation of sixty-seven property-holders occupying an area of 10,857 metres.

Before entering the Bourse, let us glance at the two structures whose façades on the circular Rue de Viarmes, which surrounds the structure, rest on Doric colonnades like that of the Theatre Française. The style of this colonnade is grand and rich, and aids in giving this side of the Bourse a decorative air which the other side lacks, as there the old houses are still standing. Of the Halle au Blé, the metallic dome has been preserved, and, consequently, the interior wall. No more have they destroyed the remarkable double spiral staircase, by which people ascend by two spiral flights crossing one another, but never meeting, in the same way as in the staircase at Chambourd. This staircase is directly opposite the principal entrance, and is close to Bullant's Column. A basement four metres in depth has been dug under the hall for the installation of the heating apparatus, the electric-light machinery, the store-rooms and laboratories and improved ovens. The outside circular wall, which is a metre and a half in thickness, has been destroyed and replaced by a thinner wall, which does not have to resist, as the old one did, the thrusts of two tiers of stone vaults. The buildings surrounding the hall contain a first floor, an entresol and two stories above, the upper one of which is in the roof. At the height of the first story is an iron balcony which commands the hall, and a second balcony of stone crowns the entablature at the height of the second story. The second story contains, ranged about the circular hall, a large vestibule, rooms for correspondents and reading, offices of the telephone and telegraph, the secretary's room, toilet-rooms, clothes-rooms and a general hall of waiting decorated with a chimneypiece copied after that by Jean Goujon in the Louvre. Two spiral staircases of carved wood lead from this waiting-hall to another room in the entresol, called the Salle de Filières, where, at the end of each month, tradesmen gather for the liquidation of their accounts. Independently of these different rooms, the ground-floor is also occupied by offices and private rooms. The two most important offices are occupied by the Sindicat Generale and La Compagnie des Courtiers Assermentés, which, on the floor above, expand themselves through several large offices. In the second story are found the appraisers' rooms, which are connected with all the professional syndicates and administrative offices of such syndicates. A central circular passageway, lighted from above, separates the offices opening on the hall from those which face the street. The exterior aspect of the monument owes its greatest originality to the round form which is rarely encountered, and the ancient dome of Belanger, which has been so ably utilized and restored. The style is Classic, and the Doric ordonnance of the circular façade is interesting as a study of the order, since it is treated with firmness, and the proportions are happy. Coupled pilasters support an entablature which projects between the bays, the frieze of which is ornamented by discs between the triglyphs. In the bays between these coupled pilasters, circular-headed openings light the entresol and give access to the ground-floor. At the first story, the square-headed windows are divided into two openings by a pilaster, which forms a mullion.

A balustrade crowns the façade and conceals the gutter; it is interrupted at the right of the coupled pilaster by pedestals upon which will later be placed statues of the principal cities of France, which will thus furnish a crowning feature for the edifice. The principal entrance is accented by a grand pediment carried on four coupled Corinthian columns. The typanum is decorated with the arms of the City of Paris, supported by two genii, and crowning all is an allegorical group representing the City of Paris protecting Art and Industry. This fine bit of sculpture is due to the chisel of the author of the monument to General Chanzy, M. Croisy. The projecting angles of this pediment are surmounted with groups which represent children upholding a caduceus, due to the same artist. A large full-centred door gives entrance to the vestibule. Above a stone balcony, supported by lion-headed consoles, forms a projection before one full-centred opening, which is divided into three parts by two stone mullions. The general effect of this entrance is less satisfactory as to proportion. It lacks firmness. The completely isolated columns are too wide apart. The door and the bay above are too squat, and fail in not making a single *motif* projecting from the background in place of being separated and absolutely cut by the stone balcony as now.

The interest in the interior of the Bourse rests principally upon the grand paintings which decorate the fair surface of the dome;

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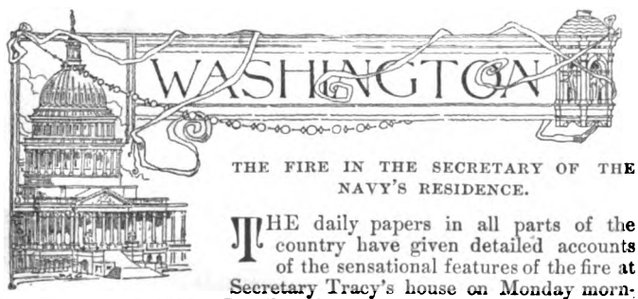
these, divided into four parts, symbolize commerce in different parts of the world. The large space is reserved to Europe, and two panels are devoted to it. In one, very ably composed by M. F. H. Lucas, we see on the left workmen black with coal-dust, their naked bodies bent under the weight of sacks of coal, directing themselves towards a factory, whose chimneys are seen in the background. At the side, in a clearer and more lively tone, French harvesters in the midst of the golden grain drink with the pretty gleaners. Farther on Spanish *manolas* are emptying their baskets of oranges, which roll out in cascades, and near them Greeks and Turks are chatting together, resting upon their richly ornamented muskets. It is a gay and luminous painting, which contrasts well with the second panel consecrated to Europe, which represents Russia in particular. M. Langée has powdered with snow a ship, from which is being discharged a cargo consisting of lumber, fish and furs, the principal products of Russian commerce. This decoration is the least successful of the four. It is heavily treated, and is composed without great display of art. The America, by M. Luminais, has much better qualities. In the centre of the panel, naked savages, absolutely ignorant of the benefits of civilization and commerce, are entrapping a jaguar for the sake of his skin, from which to make a breech-cloth, probably. At the right, buffalo-hunters form a very well-treated group, and on the left, Europeans are unbaling their merchandize. In the background the smoke of an approaching train crossing the pampas obscures the sky and allows a glimpse of Christopher Columbus standing upon the bow of his ship, and seeming very proud that without his aid M. Luminais could never have accomplished his decorative composition. We next come to Asia and Africa, combined by M. Clairin in a charming panel full of light, color and movement: European tradesmen are being joyously welcomed by the pretty little Chinese and Japanese girls clothed in rich stuffs, who are evidently delighted with the Parisian trumpery spread before them. In the background a blue and sunny sea stretches out as far as the horizon. Here proud and haughty Moors of Morocco wrapped in their great burnooses, and wearing pointed broad-brimmed hats, are spreading before the eyes of the Europeans beautiful carpets, arms and damascened work, while in the centre, ill-looking Malays embushed behind a rock, lance and creese in hand, seem little disposed to accede to the suggestions of making a trade.

These four grand decorations are separated by *motifs* treated in grisaille, by M. Mazerolles, and form, in spite of the difference of interpretation, a fairly homogeneous whole. They bear witness to the importance which is being given to similar decorative painting in all our public buildings.

Very modern in its appearance, the decorations of the Bourse du Commerce are slightly tinged with the Classic spirit of the whole building, which has called for a total expenditure of seven or eight million francs.



THE FIRE IN THE SECRETARY OF THE NAVY'S RESIDENCE.

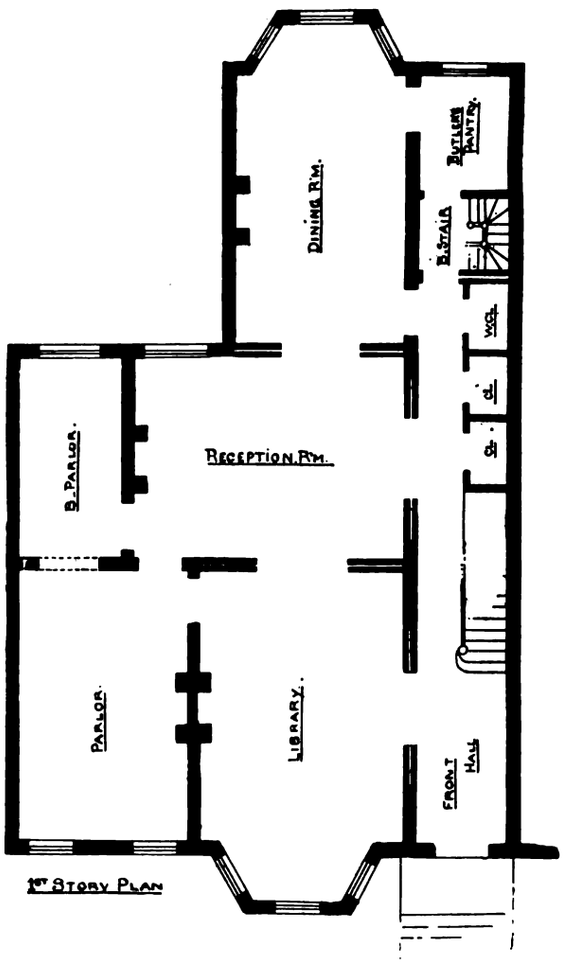
THE daily papers in all parts of the country have given detailed accounts of the sensational features of the fire at Secretary Tracy's house on Monday morning, February 3, 1890. It will, without doubt, interest the profession to read a more technical version of the affair, giving probable cause, method of progress, and damage caused to the building by the fire.

On Wednesday morning, I received permission to go through the building. The house was just as it had been left after the fire, except that the larger part of the furniture had been removed. I first made a careful investigation of the basement, everything was here intact. The steam-heating apparatus was one of the ordinary house-boilers, made to blow off at a low pressure, the safety-valve being weighted at ten pounds. The ceiling of the basement had not been broken through in any place even by the water running through from above. There was a space of fully three feet between the boiler and its smoke-flue and the ceiling. The heating was principally indirect; the coil boxes and floors above them were in perfect condition. There was a small gas-engine in the front-cellar room, which was apparently in good condition, and there were no cracks or crevices in the ceiling by which gas could have passed into the rooms above.

It was clear that the fire did not originate in the cellar, although our Building Inspector at first attributed it to the leakage of gas from this engine. The gas would have had to find its way through the unbroken ceiling and floor into the room above where the fire started, whereas, it would certainly spread throughout the basement before this could have occurred.

Another expert, a Government Steam Expert, this time, attributes the fire to superheated steam. We all know that steam cannot, when in contact with water be heated to a greater degree than that normal to its pressure. In this case it would have been 240, only a little above the temperature of boiling water. But as the floors over, and wooden boxes around the coils are intact, it is not necessary to show the fallacy of his reasoning. It is clear the fire did not start in the basement.

It is equally clear that the fire originated on the first floor, in the room called the library. This room had all its walls and ceiling finished in natural wood, which, I understand, had been finished in oils and varnishes. At the time of my inspection the entire surface, not a space as large as a dime being overlooked, was one mass of charcoal. Although this wood was only half an inch thick, in many places it had not been burned through, but there were several places where it had been broken through after the fire, disclosing the fact that the back of the panelling was unaffected by fire, although it stood out from the wall at least four inches, and would have formed an excellent conduit for the conveyance of fire, if it had originated from the gas, steam, or smoke pipes in the cellar. The condition existing locates the fire directly in this room. The window-shutters, which were folded back in the boxes, had only the exposed side of the one flap charred. The evenness with which the fire spread itself over the entire room, and, judging from the depth to which the wood was affected, the short time that it must have burned before it was extinguished was remarkable, I examined the fireplace, but there was no sign of a fire having been lighted in the grate that morning, or of there having been one the day before, there were neither coal, cinders, ashes, or kindling-wood. I pulled away some of the wood from around the boiler flue, which goes up through this room, it was bright on the side next the flue, charred on the side next the room. A defective flue was certainly not the cause of the fire. The rapidity with which the fire extended from this room



was phenomenal. In the testimony of the coroner's jury the following facts were brought out.

About 6.55 A. M., a colored man saw fire in the front bay-window, he ran up the front steps and rang the bell. The butler came to the door, and then was first informed that the house was on fire. They opened the sliding-doors between the hall and library. The butler says the room appeared one mass of fire, he ran up the steps and aroused the family by knocking at their doors. The sliding-door was left open, although the butler thought he closed it. It was found in the brick pocket only slightly burned, while the other leaf was charred over its entire surface. When the butler reached the third story there was so much smoke that he found it necessary to return by the back stairway. A few minutes after seven the engines arrived, at 7.10 Miss Tracy's body was on the sidewalk, and at 7.38 the fire was out. By reference to the plan, the condition of the

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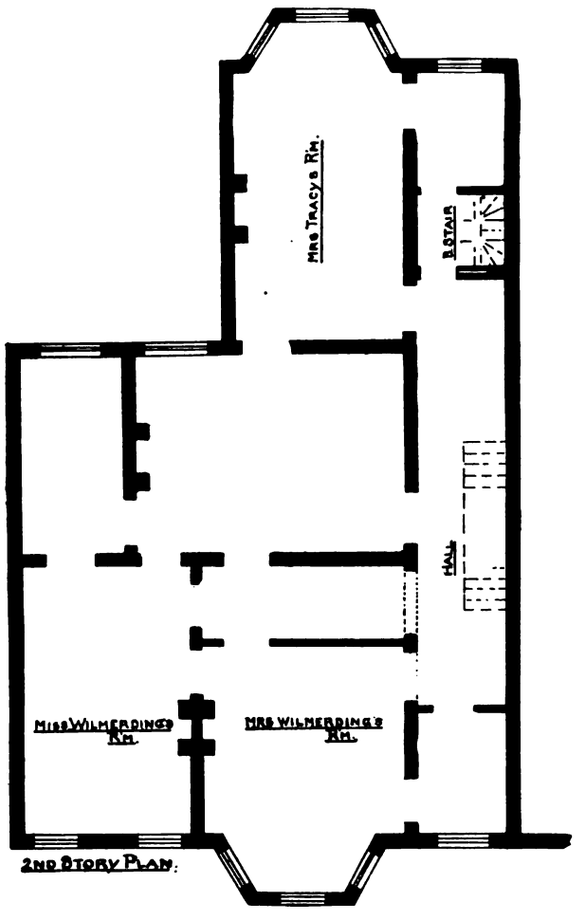
other rooms on the floor will be readily understood. The front parlor, with hinged doors between that and the library, one of which had been knocked down by the firemen, had only the top of the door cornice slightly charred. The walls, ceilings, and mantels were black with smoke. The back parlor was badly smoked. Between the library and reception-room there was a pair of sliding-doors, one leaf of which was out of the pocket; this was charred completely on the library side and slightly on the reception-room side. The mantel was charred on the top, but the large mirror in the over-mantel was affected only by smoke. The sliding-doors between reception-room and dining-room were closed, and slightly charred on reception-room side. The inside of dining-room and pantry were not affected by the fire and only to a very limited extent by the smoke.

The hall was the highway of communication between the library and the other portions of the house. When the butler left the sliding-door open, the fire must have spread to the wainscoting of the hall, which was about four feet high, thence to the steps. There were a number of closets under the steps with shelves, which were burned entirely in two.

The back stairway was closed off from the front hall by a sliding-door, which was badly charred on the hall side, but it was a sufficient barrier to prevent the fire from passing into the back hall, which was affected by smoke only in the two first stories.

There is little doubt that all the family might have saved themselves by going down the back stairway. It is a good illustration of the uselessness of expecting people to avail themselves of unusual methods of egress in time of emergency.

The fire passed up through the hall, destroying banisters and rails



2ND STORY PLAN.

in the second story, burning the bed-room doors nearly through, but the fire itself apparently did not get into the bed-rooms on this floor where all the family, except Miss Tracy, slept. None of the woodwork in these rooms was charred, but the paint was blistered by heat at the end of the room farthest from the hall. The ceilings, walls, and woodwork were black with smoke. The fire passed down the T-shaped portion of the hall shown in plan, which had clothes-presses in it, but did not burn through into any of the bedrooms, although it did get through into the front bath-room, and charred the woodwork slightly in that one room.

The fire seemed to have increased in intensity as it passed towards the roof, where it spread, burning all the roof timbers, leaving only a limited number of pieces in place. The ceiling-joists falling transferred the fire downward to the third story, where it did more or less damage in every room. The back portion of the third story was a mansard roof, which, of course, furnished additional fuel for the fire. The roof is a wreck and the third story about the same, although the fire in no case has burned through the floor into the second story. The frame of the stairway between the second and third story is so badly burned that it is ready to fall.

The cause of the fire not being due to a defective flue, the heating-apparatus, an open fire, or a gas-explosion, is something of a mystery.

It must have originated, as the fire-marshal thinks, in a lamp explosion. The only explanation would be a lamp, or incendiarism, and there seems to be nothing pointing in the latter direction.

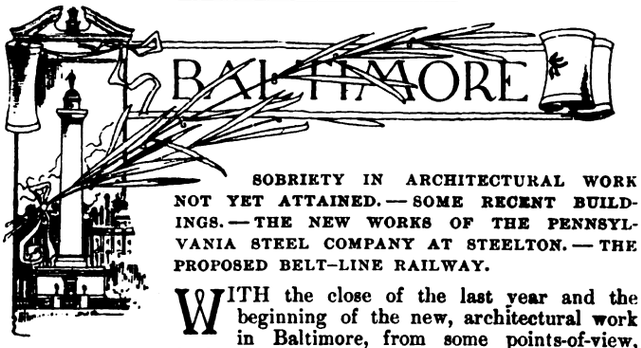
In his report, Fire Marshal Drew says:

"I am of the opinion, while, of course, there is no direct proof, that this fire originated from the explosion of a coal-oil lamp, a large double-burner duplex-lamp being kept on a table within the circle formed by the large bay-window, which lamp was lighted every night. It is very likely that when the family retired the night before the fire instead of extinguishing the light the blaze was turned down low and left burning, which is a very dangerous practice, as from this cause the wick is apt to become crusted, preventing a free flow of flame and keeping the heat below the crust, thereby causing the thin brass work of which the burner is composed to become so hot as to generate gas within the bowl of the lamp, causing the same to explode. If this was the case, as I have every reason to believe, pieces of the lamp being found scattered in different directions over the floor within the lines of the bay-window, and, taking the surroundings into consideration, the bay-window being heavily curtained with silk and lace draperies and in close proximity to the lamp, the three doors leading from this room being also heavily draped with silk portieres, the room itself being cased in panel-work of wood, both wall and ceilings, and this being heavily coated with hard oil and varnish, it would take but a very short time to envelop the entire room in flames."

It has been stated that Mrs. Tracy put this lamp out before retiring, but it is possible that in turning it down low she may have failed to put it out while thinking she had done so.

There is also a lesson to be learned from this fire that may be used in reference to fire-escapes. Nearly all fire-escapes stop at the second story, or have an extension ladder, which ladies and children could not work.

In this case Mrs. Tracy jumped or fell from the second story back room, and Mrs. and Miss Wilmerding from the second story front room, when in one minute, from the testimony, they would have been rescued with ladders. Of what use would the ordinary fire-escapes have been in this case?



SOBRIETY IN ARCHITECTURAL WORK NOT YET ATTAINED. — SOME RECENT BUILDINGS. — THE NEW WORKS OF THE PENNSYLVANIA STEEL COMPANY AT STEELTON. — THE PROPOSED BELT-LINE RAILWAY.

WITH the close of the last year and the beginning of the new, architectural work in Baltimore, from some points-of-view, may be said to be fairly active, although just at the moment a large proportion of it is, perhaps, confined to a few offices; but the dictum from these few would undoubtedly be that the profession is now flourishing from both an artistic and a lucrative standpoint — a fact possibly true if the standard is a question of quantity, the amount of good material employed, and substantial building and mediocre design produced, accompanied, apparently, by a remarkable degree of self-satisfaction on the part of each office with its own work, and an equally unanimous disapproval of that of all others.

There certainly are to be found, however, here and there, among the later designs, some very good bits of architecture indeed; but this result still gives one a sort of impression of being somewhat accidental, and the fact that the last design from any office is marked by merit and interest does not seem to insure the next thing from the same hand (or, at least, over the same signature) from being conspicuously devoid of either quality. Should a thoroughly unprejudiced professional expert be imported to give an architectural criticism upon what he finds in Baltimore, the result would probably greatly surprise both architect and client. It is doubtful, however, if it would have the slightest effect upon the already-formed opinions of the architects themselves, while the public, in their blissful ignorance and local pride and prejudice, would loyally follow the prophets of their own country.

It may be claimed, not without some reason, perhaps, that however true the fact, it is not desirable to have an open expression of such an opinion; but certainly a frank recognition and statement of any regrettable condition of affairs is a much longer step towards its correction than either indifference to it or purposely ignoring it. It is not to be denied, however, that there are probably two or three men in the profession who are, perhaps, not absolutely satisfied with the perfection of what they have already done; who see possibilities of progress for themselves, as well as for others; and who also recognize it as a fact, when they find themselves sometimes doing a good

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thing, that they are simply plodding in the safe and well-worn paths of stronger and better predecessors; but they would scarcely dare, from business considerations, to so fly in the face of Providence as to express such a self-derogatory opinion in the hearing of the business public.

Among the things actually erected during the last year, there has been no one building in any class of special importance calling for special mention. As usual, a large number of dwellings have, in the popular and probably accurate phrase, "gone up," the majority of them by the hands of the speculative contractor, and to which the criticism once made by a rather sarcastic young writer at Bar Harbor is applicable, when he said of the costume of a certain young woman that "she looked as if the materials had been fired at her": in the case of our buildings there is a suggestion of rather more powder than good bricks and mortar.

We do hail with satisfaction, however, signs of a change for the better, in one direction at least, in this army of poor dwellings that is taking possession of our land and literally devouring our substance in many ways; for however cheap their construction and ill-arranged their interiors, there is decidedly less of the meaningless and hideous "ginger-bread" ornamentation on their fronts than formerly. Moulded bricks and terra-cotta, galvanized-iron and wood, most uncalled-for bits of glazed tiles and stone carving, are giving place to a certain amount of simplicity, where plain surfaces and natural construction are allowed to take care of themselves. There is still, nevertheless, an unconquerable abhorrence of a straight sky-line under any circumstances, however small and square the building and flat the roof, and pediments and pinnacles of all imaginable forms still break out at every point, even when their thin profiles often show there is nothing behind them or inside them. One other local style of design, common also in Philadelphia, we think, still holds its own to a great extent here, even with those who ought to know better; namely, the treatment of the two fronts of a corner-house quite independently of each other, or rather concentrating all the design on the one side which is assumed to be the front, often with costly material and work, and letting the other side take care of itself in a cheap way, with no treatment at all. This is continually done on the corner of two streets of equal widths and of almost equal importance as thoroughfares with a trustful, ostrich-like confidence that the public will not look at what is supposed to be hidden, and with a satisfied assurance on the part of the owner that he possesses a handsome and complete house, in happy ignorance that such is not worthy the name of architecture at all, but is an absurdity in the eyes of the stranger.

Of the few dwellings designed by the architects, only one or two on St. Paul Street and Eutaw Place are of interest, while of the work on public buildings, perhaps the things that attract most attention are the remodelled interiors of the National Bank of Baltimore and of the Baltimore Savings Bank, and the additions to the Church of St. Michael and All Angels, all completed within the last few weeks; and also, finished some short time ago, the little "Levering Hall" for the Hopkins University, which, though small and modestly tucked away in an obscure and accidental spot, as is the apparent architectural policy of the University, is not without interest of character on the exterior.

As for the work that will mark the present year, either nearly completed, already under way, or for which drawings are made, there may be noted among other things the Bryn-Mawr School, several large office-buildings and warehouses in the business part of the city, the Maryland Club-house on Charles and Eager Streets, and another large club-building proposed for Eutaw Place, the church on Maryland Avenue and Preston Streets, and a large Jewish synagogue, the last offering rather exceptional opportunities for interesting design, with suggestions and inspirations to be found in existing types, which we may hope no adverse circumstances and economic considerations will prevent the architect from developing.

Beyond the immediate line of architectural interest, but having the strong indirect influence upon it that all great schemes in a community must have, involving commercial activity and large expenditures, are two vast enterprises in our midst that are just now deservedly attracting very general public attention, the one an accomplished fact (already doing a big and rapidly growing work) and the other still on the ragged edge of uncertainty as to whether it shall really have life or not. We refer to the great manufacturing plant at "Sparrows Point" or "Steelton," and to the proposed "Belt Line Railroad."

Two and one-half years ago "Sparrows Point" on the shores of the Patapsco, a few miles from the city, was a deserted spot, much given to mud and malaria, with one lonely farmhouse upon it. To-day it has about two thousand inhabitants, and is one of the busiest places of its size on the face of the globe. The great Pennsylvania Steel Company, possibly unsurpassed in its kind by any in the world, having outgrown its old limits and resolving to extend its industries, purchased about 1,200 acres at this point, and the transformation immediately began. Piers were constructed, giving it a harbor capable of accommodating the largest vessels, a railroad was built into the city connecting it with the great trunk lines, and a machine brick-yard started with a capacity of 30,000 bricks a day. The place is now laid out in streets, lighted by electricity, with three churches, two school-houses, a large store-building and numerous comfortable houses for the people, while the building for the four great furnaces, two of which are already at work, is 100 feet wide and, when completed, will be 1,130 feet long. Thirty years ago the best furnace produced about 30 tons of iron a day. When in full blast these four new furnaces will require 2,000 tons of ore, 1,200 tons of coke and 600 tons of limestone, producing 1,000 gross tons of pig-metal per day, and are expected to run for several years without blowing-out. This will demand at least one steamer load of ore a day, brought chiefly from Cuba and Spain, where the Company owns vast mines of superior quality and practically inexhaustible, and it is anticipated that the effect on the general commerce of the city by the return cargoes required by these numerous vessels will be very appreciable.

There is now in course of erection here also a Bessemer mill for the manufacture of steel, with all the most approved modifications which, it is said, will cost nearly a million dollars. In fact, the Maryland "Steelton" is decidedly Baltimore's most active and growing suburb.

The other great project important to the welfare of the city is now in the hands of the Legislature, and its fate is still undecided. It is, briefly, the expenditure of about five million dollars of capital, to be brought here from outside sources, in the construction of what is called the "Belt Line Railroad," encircling the city and connecting with all the principal railroad lines as it crosses them, giving all an easy access to tide-water, and forming also, it is claimed, a means of rapid transit from different parts of the city for local travel. Starting near the Baltimore & Ohio Camden-Street Station, at its most southern point, it is to proceed due northerly under the bed of Howard Street by a double-tracked tunnel 5,400 feet long, and at a depth of from about 25 to 50 feet below the surface. Emerging thence near North Avenue it is to continue still farther north and then easterly until, beyond the eastern city limits, it touches the principal railroad lines at that point near tide-water.

All possible protection and every advantage is promised to the public by the projectors, with handsome passenger stations at convenient points and frequent "rapid transit" trains around the city; all of which may be very possible and supply a long-felt need — with the proper construction and management; but as one looks at the diagram illustrating the proposed scheme, the most conspicuous thing that strikes one is the undoubted advantage to the Baltimore & Ohio of this all-rail connection between its Northern and Western branches, while the other advantages to the city seem feasible, but less certain, and the possibility of rapid local transit in both directions over a road of only two tracks, probably blocked at all hours with the through trains and freight of one or two great trunk lines, is not at all clear to those uninitiated in the mysteries of railroad management. However, *nous verrons.*

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF MRS. T. T. HAYDOCK, EAST WALNUT HILLS, CINCINNATI, O. MR. J. W. McLAUGHLIN, ARCHITECT, CINCINNATI, O.

[Gelatine Print issued only with the International and Imperial Editions.]

THE materials are local blue limestone, with light sandstone trimmings. In certain places there has been introduced an irregular mosaic, in color, of split cobble-stones (from the bed of the river), which, with the red tile roof, gives life and animation to the blue-gray walls. The stable, adjacent on the east, is also built of blue-stone, with red tile roof.

COMPETITIVE DESIGN FOR THE CATHEDRAL OF ST. JOHN THE DIVINE, NEW YORK, N. Y. MR. JAMES R. RHIND, ARCHITECT, MONTREAL, CANADA.

[Issued only with the International and Imperial Editions.]

THE author of this design considers that the best-known and most dignified architectural form for a church, more especially a cathedral, to give a large, unobstructed view, is the circular dome, and the style of architecture most appropriate to that form of plan is the Classic Renaissance. A Gothic edifice is not suitable because of the long-drawn aisle (one of the chief charms of the interior of a Gothic cathedral) being so unsuitable to the modern style of worship.

The time allowed for the preparation of what are wrongly called "sketches" was much too limited, and barely gave time to prepare the mere drawings called for, without giving consideration to the design. If twelve months had been allowed for the preparation of the first designs, and three months for the final drawings, it would have been more consistent, instead of *vice versâ* being the case. The style of architecture preferred should also have been stated in the conditions. The author is fully aware of the rather crude plan, and the design, he sees, could be very much improved, but keeping the same general outline.

One could not be expected to give a well-considered plan and design for such a large edifice in the short space allowed, even although the already too limited time was extended one month. The dimensions of the building are as follows: Inside length, 400

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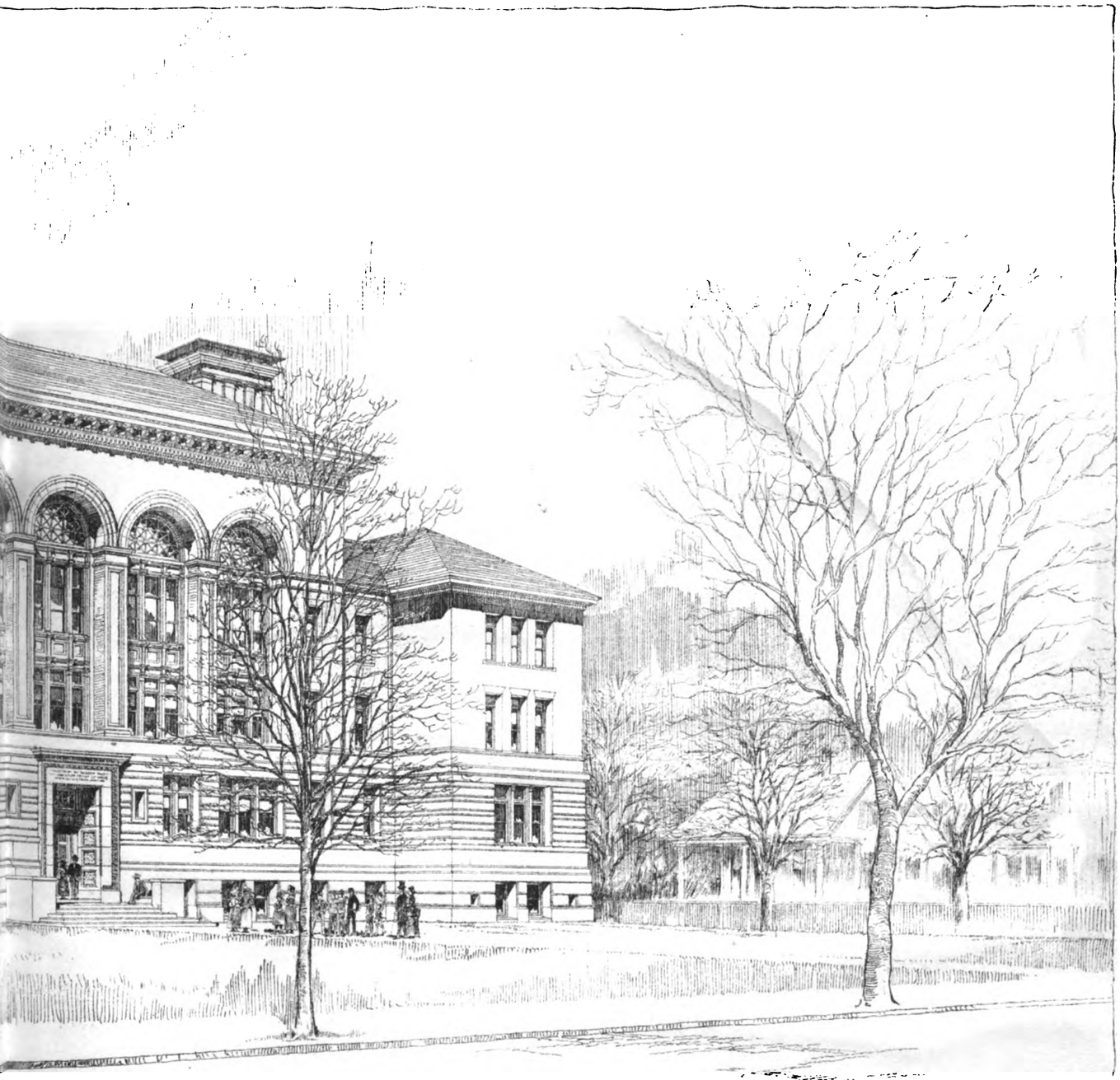

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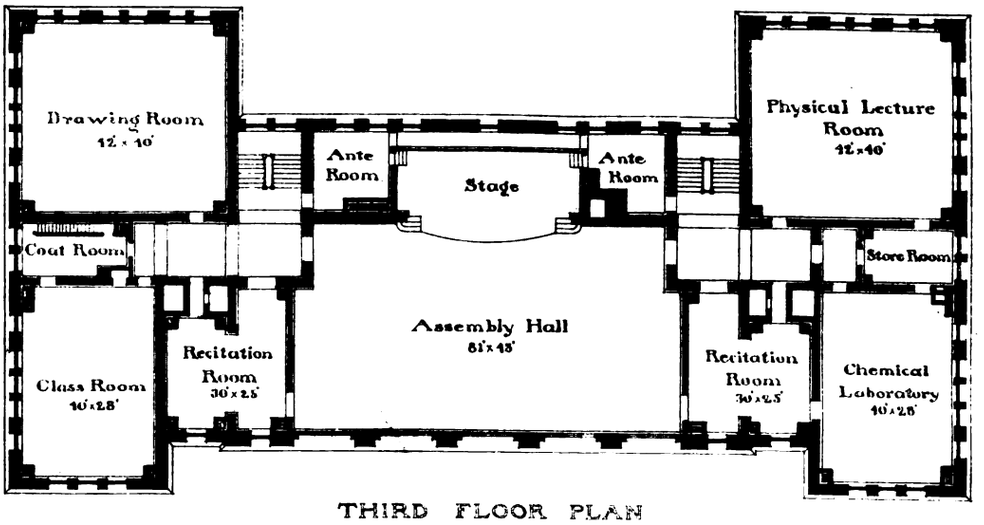
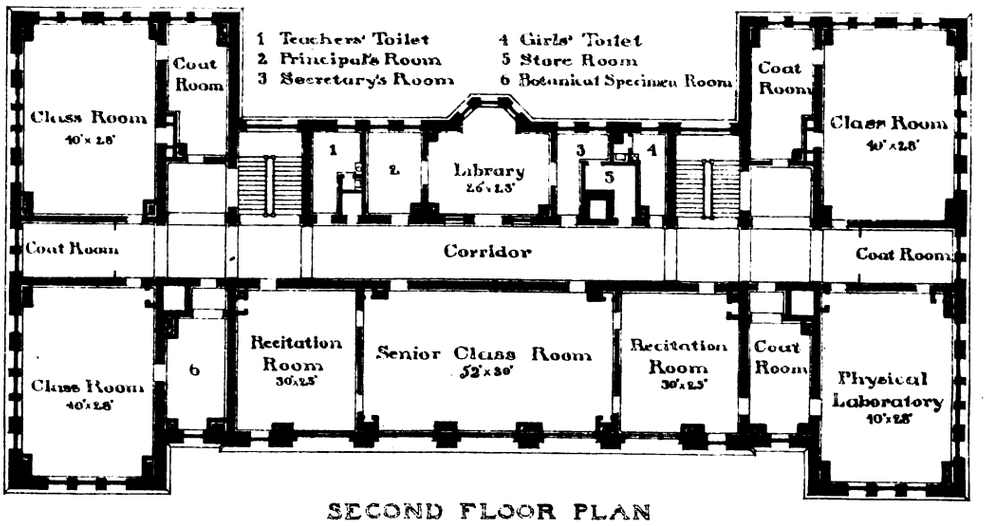


THIRD FLOOR PLAN



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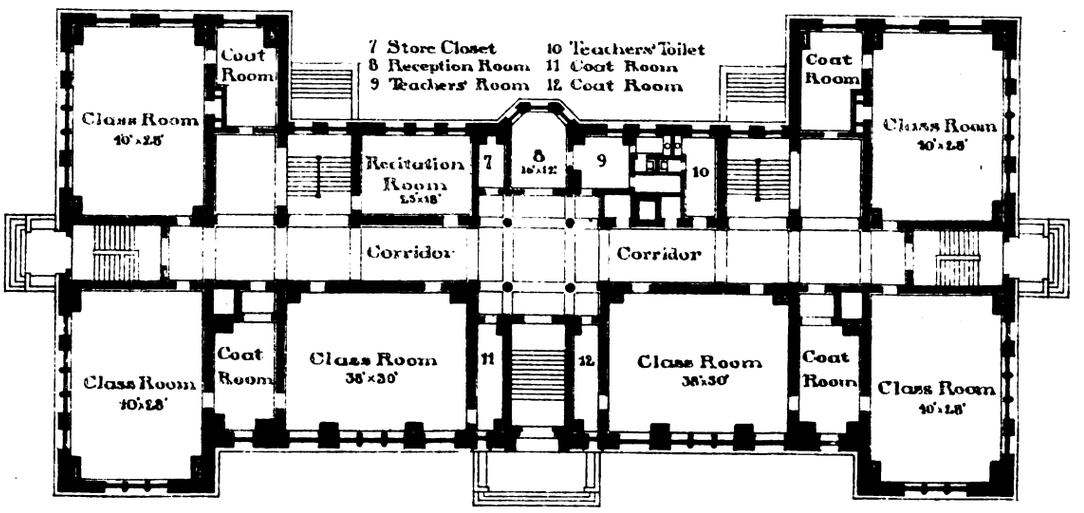

FIRST FLOOR PLAN

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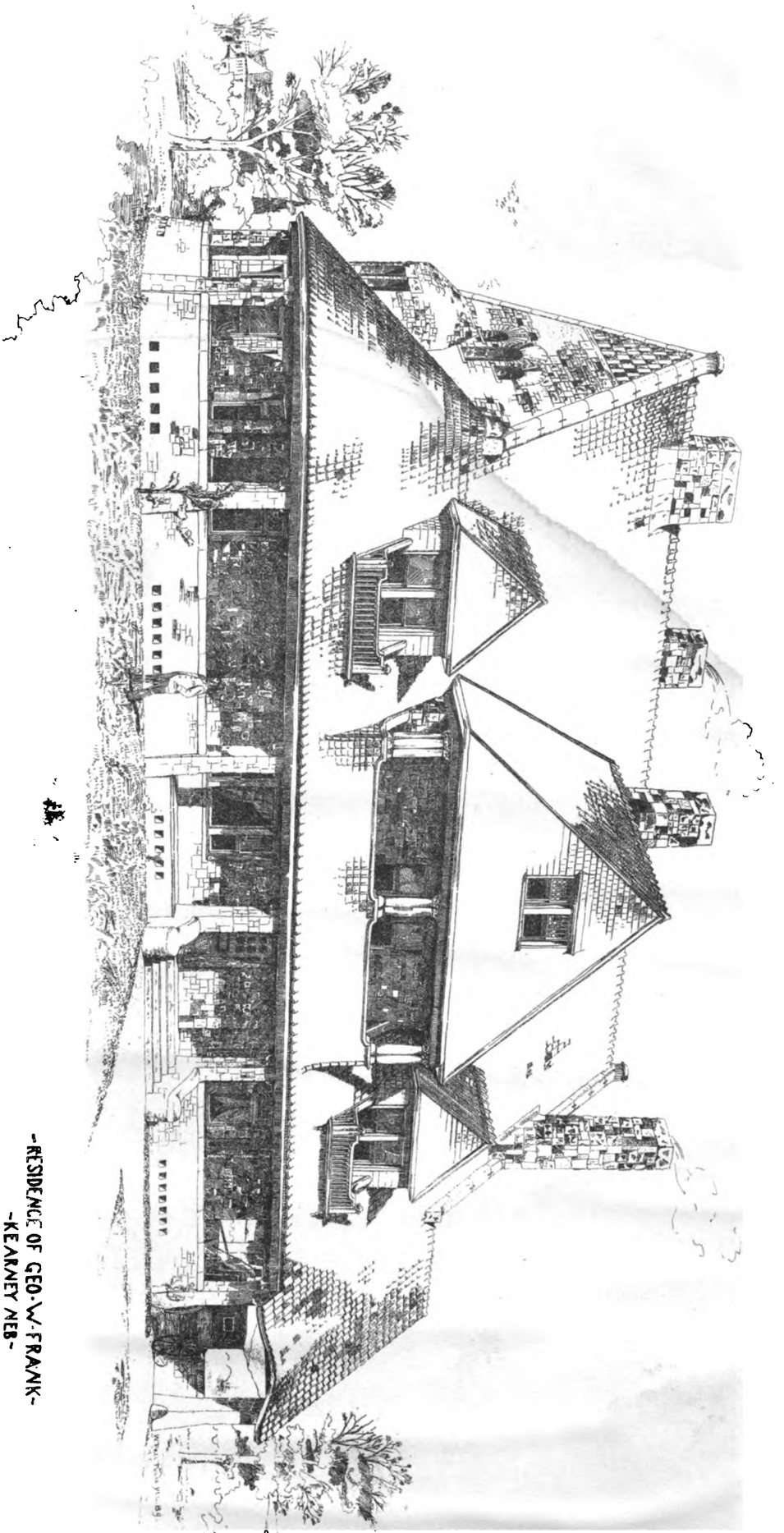

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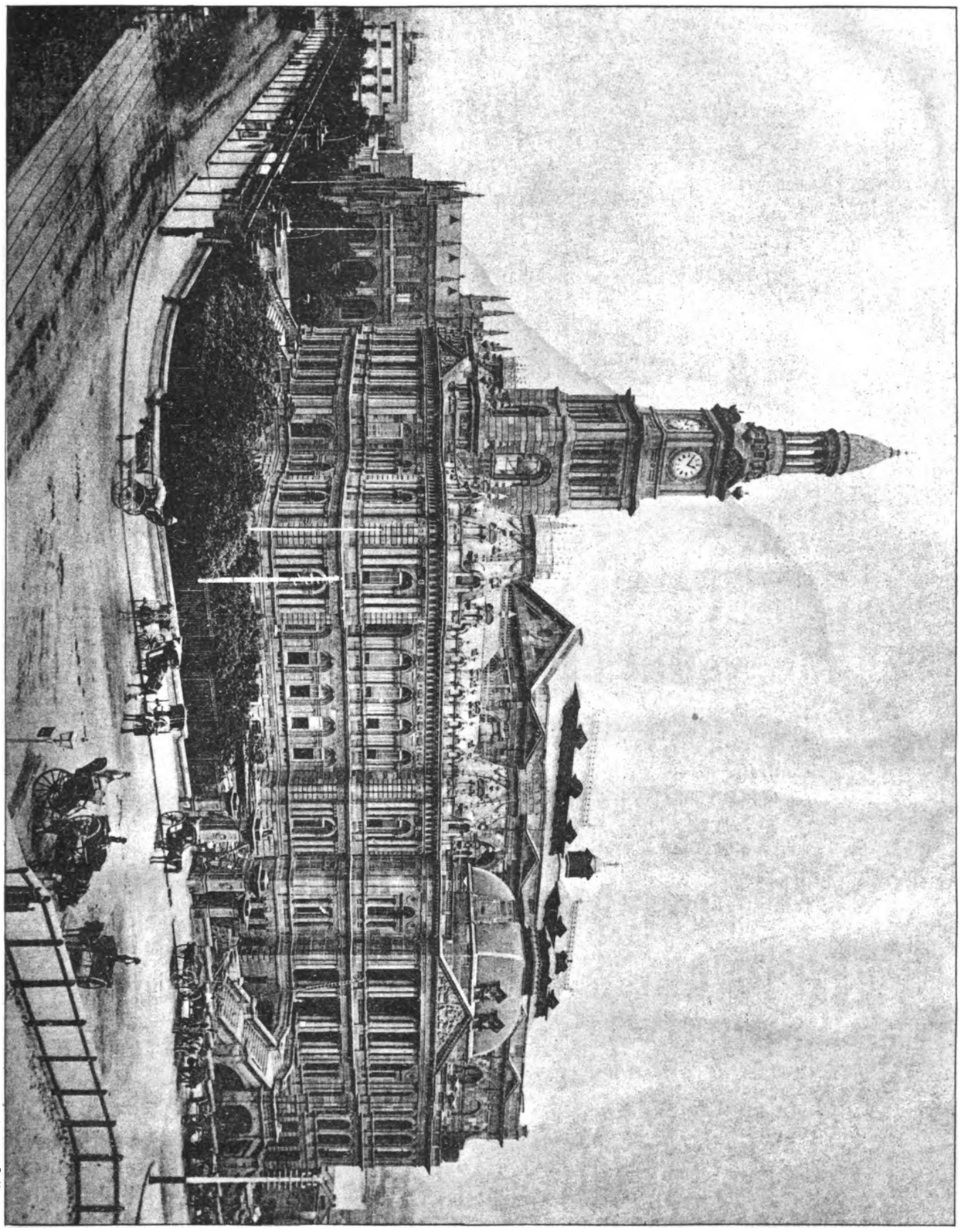

THE TOWN HALL, SYDNEY, N.S.W.

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MARCH 29, 1890.

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TRADE SURVEYS. 208

BOSTON furnishes this week one of the worst cases yet reported of the wanton tyranny which the trades-union leaders are permitted to exercise over innocent persons, who do nothing to offend them, and owe them no obedience, but whom they can deprive of their living in a moment, when the whim seizes them to display their power. A gang of carpenters, eighty-two in number, was hard at work getting ready the base-ball exhibition grounds for the Brotherhood games this summer, when the notorious Clinkard, who is, we believe, walking-delegate for four of the Boston unions, strolled by. Belated buildings, where the contractors are straining every nerve to push matters, afford excellent opportunities for mischief, and the delegate summoned the men from their work. All but seven obeyed, and were ordered to pack up their tools and go home, which they did. When the contractor, Mr. Keyes, arrived on the ground, he found only the seven contumacious men at work, and, knowing from experience what to do, he waited until evening, when he was sure of finding Mr. Clinkard at the union headquarters, and went to beg an interview with the magnate. He found the great man affable, and learned the interesting fact that the new base-ball Brotherhood "had been regarded with manifest favor by the American Federation of Labor," and that there was "an understanding that, in view of substantial support by the latter," the Brotherhood "would have its work in various cities done by members of the trades-unions." The contractor, having thus been set right in regard to the peculiar circumstances attending work for base-ball associations, proved tractable, and after an hour's conference the walking-delegate declared the strike "off," the consideration on the part of the contractor being an agreement to employ thenceforth none but union men on the Brotherhood's grounds, to maintain union wages, and union hours, and to discharge the seven men who refused to strike at the delegate's order. A man of more heroic mould would probably have rejected the last condition, on the ground that honor required him to defend to the last extremity the men who had stood by him; but contractors do not always have as much heroism as would be good for them, and Mr. Keyes's seven friends were promptly set adrift. We might say something about the folly, as well as the meanness, of contractors who, after being injured by a strike, discharge the men who did not strike, on the demand of those who did; and it is worth suggesting to master-builders that a mutual understanding for the protection of non-union men would do more to keep the union leaders within the bounds of reason than all the schemes of arbitration ever invented; but the point on which we wish to insist is that a state of things in which one man can at will point out unoffending and industrious persons, and have them visited with the most cruel punishment that civilization affords — the deprivation of means of earning a support for themselves and their families, should not last another day in this country. The little bell of our war period, at whose ringing men were consigned without trial to Fort Lafayette, marked a very feeble exercise of power compared with the despotism which speaks by the walking-delegate's signal; and we should have to go back to the mediæval tyrants, who pointed with their thumbs, as they walked about the streets, at the individuals whom their body-guard of assassins should forthwith drag into a dark corner and kill, to find a parallel to the heartless tormentors who hunt from shop to shop the poor workmen against whom they have conceived a grudge. So far as we can ascertain, although a transient flutter is sometimes raised on their behalf by the newspapers, the lot of the "scabs," otherwise known as the independent and ambitious men who will not submit to the dictation of "rummies" as to how, when and where they shall work for the benefit of their families, grows harder every day, and it is high time that the real friends of freedom and "human rights" should try to unite the efforts of non-union workmen in a determined attempt to diminish, by force of law, the power which the union delegates exercise over them through the contractors, and to enlist the contractors, as well as the public, in their effective defence.

THE opening of the building season is signalized this year by the same threats and agitations which have so long annually diverted capital, which would otherwise be used in building, into other investments, to the injury of all those persons whose living depends upon employment in building work. In New England, so far as our observation goes, the carpenters, masons, plasterers, plumbers and painters, as well as the contractors and architects, who have so long been looking in vain for the return of the active building seasons which were once the rule, are indebted for their losses and disappointments to the efforts of about a dozen men, who gain a comfortable income through their skill in blustering and agitating themselves into notice, and who find it necessary to repeat their performances every year, with some little variation in the theme, to prevent themselves from being dropped into obscurity. That their annual threats of commotion and disaster put an end to hundreds of building projects, and throw thousands of skilled mechanics out of employment, is nothing to them; all they know or care for is that agitation fills their own pockets, and the more distress they can cause among honest working people by their generalship, the faster the dollars are transferred from the hands of their poor followers to their own. This year, the building business is to be attacked, and thrown into confusion, on the ground that it is one of the rights of man to work only eight hours per day, and that all people engaged in the building trades must starve themselves until the rest of the world acknowledges the truth of this maxim. The trifling circumstance that mechanics in the building trades are already at liberty to work eight, nine or ten hours, as they choose, and that, for the express purpose of allowing them that liberty, it is now customary among contractors to pay their men by the hour, is completely ignored by the agitators, who demand, not that those men who wish to spend seven or eight hours a day in indulging that thirst for spiritual improvement which they attribute to plasterers and stone-cutters may be allowed to do so, for this is already provided for by the hourly payment system, but that no one shall be allowed to work more than eight hours a day, whether he wishes to or not. Of course, the adoption of such a rule, if it should be forced upon the trades, would bear much more seriously upon the industrious and ambitious journeymen than upon the contractors, who, after losing money on their unfinished contracts, would simply readjust their prices to the new conditions; and a rebellion would ultimately be the consequence; but as our friends, the agitators, grow fat rapidly upon commotions in the ranks of the workingmen, this prospect has no terrors for them, however it may alarm other people.

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AS our readers know, we have no desire to see the incomes or the opportunities for improvement of faithful workingmen limited in any way. If any man thinks it for his advantage to work one-third of the day, sleep another third, and spend the remaining third in amusing himself, it is certainly a good thing that, as is now the case in the building-trades, he should be at liberty to do so, but for those who wish to divide their time in this way to combine to compel others to do the same is a piece of tyranny which Americans ought to resent, and any attempts which may be made to prevent people who wish to work at their trades nine or ten hours a day from doing so, should be met with the summary energy which Americans, when roused, usually show in dealing with organized oppression. Such attempts, if the agitators should carry their point, probably will be made, as it will be very hard for native-born citizens to content themselves with working only eight hours a day. Some of them, who can use their spare time profitably in some other occupation, would be contented with the arrangement, but we are inclined to think that the general adoption here of an eight-hour system in the building-trades would soon be followed by the formation of building societies, composed of the best workmen in the different trades, who would take contracts on their own account, and work long enough, and hard enough, to make their contracts bring them in a good profit, without paying any attention to the threats of walking delegates, or the disquisitions of cheap politicians on the rights of man. In France, such "syndicats professionels," which came first into existence at a time when misunderstandings between contractors and journeymen had brought building nearly to an end, have prospered greatly. Although they operate with only the limited capital that an association of workmen can contribute, their reputation for faithfulness and honesty some years ago gained them the privilege of bidding on public buildings, on equal terms with the great contractors; and the cheap politicians, who have as keen a scent there as here for a movement which promises to become popular, are already as enthusiastic for the coöperative principle, which consists in every man accomplishing as much work as he can, as they were not long ago for the trades'-union theory of human rights, under which the laziest man is privileged to prevent any one else from doing any more work than he does, and thus getting employed in preference to him.

ARCHITECTS ought to be careful not to allow themselves to countenance in any way the questionable proceedings which are so often connected with the award of public contracts. Perhaps the officials who act for the community are guilty of as many violations of strict fairness as the contractors, but their sins are likely to be the result of ignorance or carelessness, while a contractor's offences agninst professional ethics are usually deliberate. In either case, however, it is best for the architect to express his opinion clearly on the matter, and if his advice is not followed, he will at least escape being made later, as usually happens, the scape-goat upon whom both the contracting parties load the responsibility for the consequences of their respective acts. A good illustration of a sort of transaction which owners often think harmless, but which contractors object to unless carried out by themselves, and which architects, with reason, discountenance as a violation of good faith, which, in the end, injures the owners more than any one else, is to be found in the example of the Lowell City-hall, the contract for which has just been awarded. According to the local journals, bids were originally submitted for the building, including the use of a certain kind of granite. The commissioners thought a cheaper sort of granite could be used, and asked the bidders to modify their proposals accordingly. One of the bidders, a perfectly responsible contractor, telegraphed the amount of the deduction he would make if the cheaper stone were used. This made his bid the lowest; but on the same day that his bid was received, and before the commissioners had made their decision, another firm, by a singular coincidence, discovered an "error" in the calculations on which their bid, already submitted, was based. By correcting this "error" a deduction of four thousand dollars would be made from the proposal, which brought it slightly below the bid of the first contractors, and the firm was allowed to amend its proposal to this extent, and, as amended, the proposal was the next day accepted.

NOW, we do not mean to say that the city of Lowell ought to lose four thousand dollars, because its commissioners were too squeamish to correct a real mistake in adding up a column of figures, or that contractors ought not to be allowed to correct clerical errors; but, if the mistake actually existed, it would have been easy to prove, by the examination of the papers by some unprejudiced expert, such as the architect, who would be in every way the most suitable person, that the bid of Contractor No. 2 was thus really the lowest, and the award could be made accordingly. Unfortunately, the commissioners, as is apt to be the way with such officials, chose to consider that it was no one's business but their own, how or why they made the award, and the consequence is that the citizens who think that fair play was not given in the matter show signs of intending to prevent the appropriation of the money for the building; while the contractors whose bid would have been the lowest except for the discovery of the "error" have a grievance which might easily be made to cost the city a great deal more than the difference in the bids.

MR. GEORGE KELLER, of Hartford, recently sued the New York, New Haven & Hartford Railroad Company for twenty-five hundred dollars, as compensation for plans furnished in competition for the new station in Hartford. It will be remembered that the competition for the station resulted in the rejection of all the designs, as unsuitable, and that Messrs. Shepley, Rutan & Coolidge were subsequently commissioned to carry out the work, in accordance, undoubtedly, with directions from the officials of the company. According to Mr. Keller, however, the plan as executed is substantially the same as his competitive design, and he thought he ought to be paid for it. It would have been curious to see what a jury would have said to the evidence, which, of course, would have been mainly the internal evidence of the plans themselves; but the case was compromised by the payment to Mr. Keller of five hundred dollars, the railroad officials claiming that they were in the right, but that it was cheaper to pay that amount than to contest the case.

ACCORDING to the *Tribune*, of Rome, Georgia, a rather important discovery has recently been made in Floyd County, in the shape apparently, of a vein of bauxite, or cryolite, suitable for use in making aluminium. The *Tribune* appears to think that the vein contains pure aluminium, but even Georgia could hardly furnish such a wonder, and it will be quite sufficient glory for Floyd County to supply an ore capable of easy conversion into metal.

ANOTHER petty annoyance has been recently added to the long list of burdens which weigh upon the time of architects. Hitherto, it has been common enough to send to architects circulars, commending all sorts of building materials and processes, which, to ensure their being read, the recipient was requested to acknowledge. Perhaps a few unemployed beginners read and acknowledge these gifts, but the great majority of architects sweep them every morning into the waste-basket without opening them. Now, however, perhaps as a result of the reduction of postage rates, has appeared a much more troublesome device. The dealer in gas-fixtures, or the contractor for electric wiring, or the agent for patent plastering, or the proprietor of a patent chimney-top, ascertaining from the building journals that Architect A is to build for Mr. B a mansion at Oak Hill, encloses one of his circulars in a sealed envelope, puts on a two-cent stamp, and directs it to Mr. B, "care of Architect A." The architect receives it with mingled perplexity and disgust. He knows that it is simply an advertising circular, that the enterprising dealer intends to force him to convey, with a sort of implied guaranty, to the customer whom he wishes to catch, but, although his first impulse is to bury it in the deepest recesses of the waste-basket, he dares not carry out his intention. After all, it is a sealed letter, addressed to some one else. He cannot open it, to make sure of the worthlessness of its contents, nor does he feel justified in neglecting or withholding it, so, with execrations on the diabolical ingenuity of peddlers, he encloses it in another envelope, and forwards it to his client, in a good many cases, we suspect, with a warning to have nothing to do with people so devoid of decency.

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MILITARY ARCHITECTURE.[1] — II.

FEUDAL ERA, FROM THE FIFTH TO THE FIFTEENTH CENTURY.

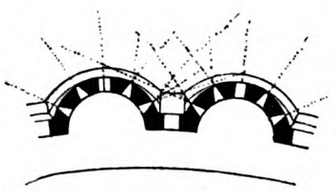

Fig. 11. Trace of the Wall of the Château-Gaillard.

WHILE the Visigoths, from the Narbonnaise to the Loire, continued to surround their cities with walls, in imitation of the models bequeathed to them by the past (Narbonne, Agde, Carcassonne, etc.), social disorganization, by opening the era of feudal anarchy, led to the construction of fortified dwellings and castles, in the north of Gaul, and thus brought about a complete transformation in the military architecture of that region.

These castles, or châteaux, are the distinctive mark of the period, and their study furnishes almost the entire history of the art of the military engineer up to the moment when a new centralizing force arose, which stifled feudal selfishness in solicitude for the general defence of the country.

Viewing the subject in another light, it was between the fifth and fifteenth centuries that the art of fortification, returning to its starting-point, traversed anew the successive steps already taken by ancient civilizations, and which led up to the modern era ushered in by the invention of metallic projectiles.

It was a long way from the dwelling of the Frankish chief, raised on a mound (*motte*) and defended by a wooden stockade, to the redoubtable fortress of Coucy: the history of this evolution offers archæologists a most attractive subject for study, while the architect finds in the débris of this wondrous period an inexhaustible mine of rich and valuable material.

The *château à motte* is the point of departure (tenth century); then the central structure became the donjon; the palissades were replaced by a solid wall flanked with towers; in the space comprised between the enceinte and the donjon, in the bailey (*baille*), the feudal lord provided shelter for his armed retainers and servants. Often even, while the enclosure around the donjon was preserved intact, a walled court-yard was laid out where the servants' quarters, the stables and, when possible, a mill were erected.

In the eleventh century study was already directed to the works of the ancients, and much useful knowledge was derived therefrom. Geoffroy Plantagenet read a treatise by Vegetius while he was besieging Montreuil. It was, however, during the Crusades, in the countless sieges to which the citadels of Asia Minor were subjected, that the skilful engineers were trained who were destined to carry the construction of fortified castles to the degree of perfection attained in the fourteenth and fifteenth centuries.

Until the thirteenth century, as we are reminded by Viollet-le-Duc, the resistance offered by fortifications was wholly dependent on their passive force, on their massiveness and the position of their constructions. But against the methods of attack brought back from the Crusades, and especially against mining, they were unavailing. An effort was then made to keep the enemy away from the foot of the walls by leaving a broad space, or *lice*, in front of them, and running a second line of walls and towers around it. Ditches were dug outside of these. The gates and entrances to the bridges were covered by outworks, known under the Saracen name of "barbacans."

The tower, in its lower portion, offered no way of resisting the miner beyond that afforded by its own massiveness. A vaulted room was, therefore, made in it on a level with the ditch, or *lice*, with an opening at the top, through which stones and all sorts of missiles could be hurled on a besieger.

On the top of the walls and towers wooden *hourds* were constructed, forming a sort of gallery projecting over the exterior face of the wall, and providing means for a large number of the besieged to beat the foot of the walls with stones and other projectiles.

The first attempt at lateral flanking, obtained by the trace of the external surface of the walls, appears in the Château Gaillard, constructed in 1196 by Richard Cœur de Lion, and in which the plan of the rampart affects the appearance of a series of arcs of circles (Figure 11).

At the same period, round towers were substituted everywhere for the square or polygonal towers. These were sometimes provided with spurs in front, and their size was increased sufficiently to allow of a larger garrison.

The appearance of fire-artillery in the besieging ranks produced but slight change in the fortifications so long as stone projectiles were still used; the balls were yet shattered against the thick walls of the fortresses. However, the close of the fourteenth century witnessed a modification in the crowning of the towers and curtains which is not without interest from an architectural point-of-view. We refer to the substitution of stone machicolations for the wooden *hourds*, which had proved a too easy prey for fire.

At the same time, the vertical, horizontal or cruciform loop-holes (*archères*) were superseded by circular embrasures with

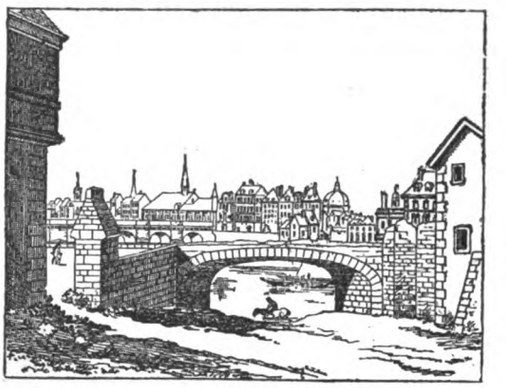

Fig. 12. The Louvre; Arch of Austria.

vertical slits above for the discharging of firearms. The roofs disappeared, and pieces of artillery were stationed on the tower-platforms.

With the fourteenth century feudalism reached its full development. The land was covered with châteaux; feudal life was, however, beginning to wane before the increasing importance of royal power. Scarcely any more defensive castles were erected; but as a protection against the common enemy — the foreign enemy — improvements were made in the already existing enceintes of the cities, and others were constructed.

It was in this state of things that the crowning transformation came through the substitution of metallic for stone projectiles. This simple modification introduced into use guns of smaller calibers, and consequently of lighter weight and greater resistance. The charge could be augmented, thus increasing the velocity and live force of the ball. Under this new method of attack the masonry walls crumbled, filling up the fosse and opening a path for the besiegers.

Then the engineers levelled towers and curtains, and covered their débris with masses of earth.

The age of stone had closed forever for fortifications, making way for the age of earth. But, before attaining the theoretic forms suited to the new conditions of siege, and which every nation later adjusted to its own needs, military architecture had to pass through a transitional period in which every piece of the old armor fell one after another; in which engineers groped their way, trusting to chance inspirations for finding effective new dispositions.

The round and low towers were enlarged so as to accommodate an increased amount of artillery on their terrepleines. Gradually these gave place to polygonal towers, in which constructions we see the first rude outline of the modern bastions. This transformation was usually confined to the towers of the enceinte outside the *lice;* soon, however, the rear wall disappeared, leaving only the low outer wall, covered with cannons and well flanked.

MODERN PERIOD.

It was in Italy, during the campaigns of Charles VIII, that the inadequacy of the old fortifications first made itself felt; and it was there that, under the impulse given to the arts by the rare geniuses of the Italian Renaissance, the new methods of fortification were first brought to perfection. The Italian engineers acquired a reputation in their art which long made them the fortress-builders of Europe. Then the Spaniards followed in their footsteps, covering their land, as well as Flanders, with strongholds remarkably well adjusted to their topographical positions.

[1] From the French of A. de Rochas and G. Espitallier in Planat's "*Encyclopédie de l' Architecture et la de Construction.*" Continued from No. 743, page 181.

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It was not until the reign of Henry IV that France ceased to be dependent on ultramontane engineers.

Meanwhile, in Germany, in 1527, Albrecht Dürer, who had studied in Italy, published the work on fortification upon which modern German engineers have seen fit to base their school and many of their methods. This great artist seems to have given special attention to the organization of the walls; he once more employed discharging-arches as a means of strengthening the escarp.

But the engineer who, according to General de Villenoisy, was really the first to combine the various lines constituting a front, that is to say an *ensemble* flanked at all points, was Paciotto d'Urbino. He was the originator of the bastioned front, in spite of the Strasburg engineer Speckel's claims to the honor. The latter was writing while Paciotto was building the wonderful fortresses of Turin, Cambray and Antwerp (1567).

The engineers who came after — Errard of Bar-le-Duc, the Chevalier de Ville and the Comte de Pagan — gradually metamorphosed the bastioned front; they systematized the use of high earth cavaliers[1] on which were disposed the batteries commanding well the country, and also counterguards, and *tenailles*, a sort of dike or bray[2], placed in the broad fosses[3] in order to protect the masonry work of the bastions and curtains (Figure 13).

It was at this stage that Vauban appeared; finding the way well paved for him, he had only to coördinate the somewhat

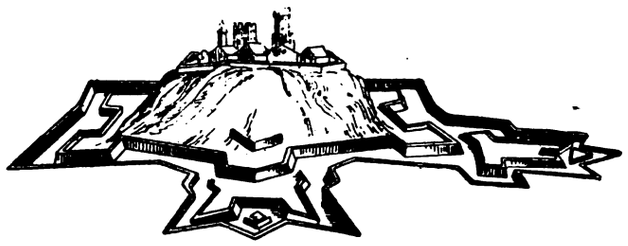

Fig. 13. Bastioned Front, by the Chevalier de Ville.

confused ideas of his predecessors to produce a clear and precise body of principles for the guidance of military engineers. Vauban's true title to renown is mistaken by the general public; he is usually regarded as the inventor of the bastioned system; he was nothing of the kind, as we have seen. But he brought to the application of existing methods an extraordinary soundness of judgment, and an unparalleled experience in the art of siege. And it was precisely in this art of siege that he showed creative genius. The *successive parallels* dug before the invested town (Siege of Maëstricht, 1672), and *ricochetting*, which he invented at the siege of Philipsburg (1688), produced a veritable revolution in the art of siege, and made it possible to reduce what had been chances to mathematical certainties.

It is to Vauban that we are indebted for the first general organization of a system of national defence that had been undertaken since the days of the Romans. It is to him, finally, that we owe the huge, regular barracks required for the use of permanent armies.

Vauban threw so much light on the art of fortification that he quite eclipsed his rival, Cœhorn, notwithstanding the latter's signal merits. Vauban's successors could do nothing more than servilely copy his works, incorporating into a system certain dispositions which, for the great engineer, had been absolutely local solutions; complicating his traces by means of a formidable series of small works; belittling and reducing to dogmatism the admirable teachings of the master.

A French cavalry officer, Comte de Montalembert, whose earliest writings date from 1761, became the founder of a new school by proposing to abolish the bastions, the faces of which, in consequence of the improvements in artillery, were dangerously liable to enfilade. As for the flanking of the foss, he obtained that by means of a small work situated in the middle of each curtain; the latter, becoming thus one of the sides of the *polygone à fortifier*, the system received the name of Polygonal System.

The small flanking work, analogous to the *moineau* of the Middle Ages, was called a *caponnière*.[4]

Vauban's teachings had taken such a strong hold in France that Montalembert's suggestions were rejected throughout the country as impracticable; and, in fact, the author's evident ignorance of construction furnished his adversaries abundant argument against his propositions. Nevertheless, the origin of the polygonal system of fortification must be referred to Montalembert, and also to the celebrated Member of the Convention, Carnot.

While the French engineer corps remained faithful to the principles of Vauban, the new ideas gained a hearing in neighboring countries; from 1815 Germany began to apply them to the reorganization of her defensive system. To the Belgian general Brialmont, however, belongs the honor of having introduced the new system, while at the same time he made an important application of the system in the new fortifications of Antwerp.

In this brief historical sketch we have somewhat lost sight of the special nature of our study, and have neglected to indicate the architectural dispositions that characterized the successive transformations which we have noted.

In the construction of the mediæval castles, full scope was given to the genius of the architect, and the ruins of those stone giants furnish us examples of architecture well worthy to rank beside contemporary churches and cathedrals.

The use of terraced ramparts, of cavaliers, of masses of earth covering the levelled walls, certainly restricted the field of art, and in their construction it was the engineer's rather than the architect's talent that was called into play. However, the walls of the sixteenth and seventeenth centuries, and especially the city-gates of that period, are not lacking in grandeur, nor in a certain robust grace quite in harmony with the purposes of fortification.

Since then — aside from barracks, which belong strictly to architecture — some fine examples of the art have been furnished, as, for instance, the vast belt of forts around Metz (1869–70), and the fortifications built about many cities in and outside of France since the Franco-German War.

CONCLUSION.

The art of fortification is at present confronted with problems the solution of which must lead to radical changes in its methods. It has entered a new era, dating, apparently, from the invention of rifled guns. Still more recent improvements have been made, by which the velocity of projectiles has been greatly increased. But the capital invention, which calls for a complete revolution of the means of defence, is the invention of projectiles charged with violent explosives, and known under the name of *torpedo-shells*.

Their destructive effects render the use of masonry escarps impossible. The premises should be absolutely underground, and every part that can be reached should, it seems, be clad in metallic armor.

After the stone age and the earth age has come the iron age. But this metallic armor and these subterranean casemates (Figure 14) furnish but a poor field for the architect's skill.

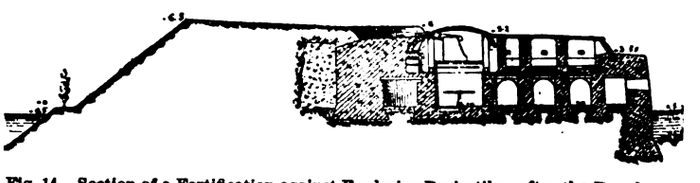

Fig. 14. Section of a Fortification against Explosive Projectiles, after the Dutch System.

We may compare the evolution of the fort of to-day to that by which the magnificent wooden ship has been transformed into the heavy ironclads, with their harsh, angular forms.

A. de Rochas and G. Espitallier.

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[1] "Cavalier." — A raised work commonly situated within the bastion, but sometimes placed in the gorges, or on the middle of the curtain. It is 10 or 12 feet higher than the rest of the works, and is used to command all the adjacent works and the surrounding country. It is designed chiefly to bring a plunging fire to bear on the assailants' works exterior to the enceinte. — "*The Century Dictionary.*"

[2] "Bray." — A wall or other work in advance of and covering the gate of a fortress. — "*The Century Dictionary.*"

[3] "Foss." — A hollow place, ditch or moat, commonly full of water, lying between the scarp and counterscarp below the rampart, and turning round a fortified place or a post that is to be defended. — "*The Century Dictionary.*"

[4] "Caponniere." — A covered lodgment sunk four or five feet into a ditch for its defence, uncompassed with a parapet about two feet high, serving to support several planks laden with earth. A double caponnière is a ditch defence arranged for flanking purposes. The double caponnière is generally placed in the middle of the ditch so as to fire in both directions. — "*The Century Dictionary.*"

Collapse of the Roof of the Flora Hall, Hamburg. — The glass roof of the great Flora Hall fell February 24. Eighty people were killed and many were injured.

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SAFE BUILDING.[1]—XXXIX.

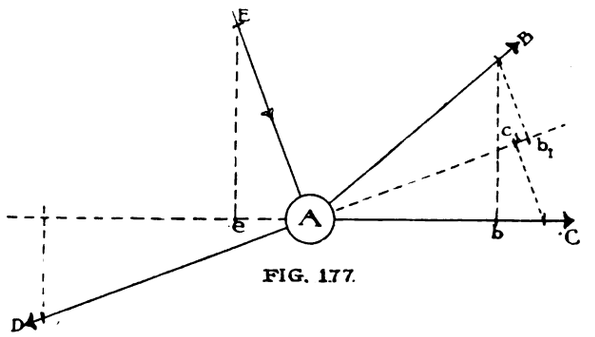

FIG. 177.

IN calculating a pin-joint, the strength of pin, as a rule, should be calculated in the several lines or directions in which it is being strained, that is first along the line of one rod, then along the line of another rod (or compression piece) and so on. In doing this all the other strains must be projected (and reduced) to the same line. If this is correctly done, it will be found in every case, that the *sum* of all the strains acting in one direction along this line will be equal to the *sum* of all acting in the opposite direction along the line. Thus in Figure 177 we have the end elevation of a pin *A* strained by three forces in tension *B*, *C* and *D* and one force in compression *E*.

Strains reduced to same line.

We will first examine the pin along the line *A C*. Make, at any convenient scale, the lines *A C*, *A B*, *A D* and *A E*, each in length just equal to the amount of strain they are subjected to. Project them all on to *A C*, then will *A b* represent the resultant or equivalent of strain *A B* along the line and in the direction *A C*. Similarly *A d* will be the resultant of *A D* along the line of *A C*, but it will be in the opposite direction; *e A* will be the resultant of *E A* along the line *A C*, but it will be noticed that though on the opposite side of the pin it is in the same direction as *A C*.

Were we to examine the pin along the line *A D*, we should have the strain of *A D* in one direction and in the opposite directions the resultant strains *A* c_1 and *A* b_1. It will be noticed that *E A* has no resultant along the line *A D*, being normal to it; and it need not be considered, when calculating the pin along the line *A D*. We might still calculate the pin along the line *A E*; we should then have the strain *E A* in one direction and in addition thereto the resultant of *A C*; in the opposite direction we should have the resultant of *A B*. The largest strain *A D* has no resultant along the line *A E*. It is evident, however, that all of these resultants will be very small as compared to those along the other lines, and therefore need not be calculated.

In Figure 178 we have a plan of the pin, showing in plan the strains and resultants acting along the line *A C*. As arranged in this figure the pin evidently becomes a double-ended cantilever, supported at the fulcrum *d*, and loaded on one free end with the load *c* and on the other free end with two loads *b* and *e*.

Arrangement of Heads.

If the strains were small, this would probably be the most economical arrangement, as *A D* could then be made in one piece. But if the strains were heavy it would require a tremendous pin.

In the latter case the arrangement shown in Figure 179 would be better. Here the pin becomes a beam, supported at both ends by $\frac{d}{2}$ (or one-half of the force *A D*); the beam carries three loads *c*, *e* and *b*. In this case *A D* would be made up of two rods, separated. The forces *c*, *e* and *b* must be so distributed as to make the least

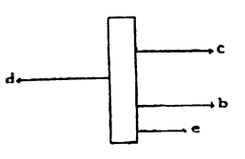

FIG. 178.

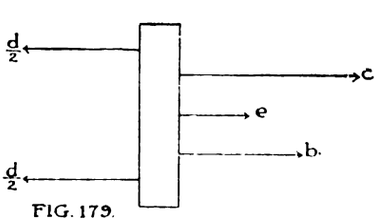

FIG. 179.

bending-moment on the beam or pin, that is, the larger ones placed nearer the supports or outer edges, and the smaller ones in the centre. Frequently it would be more economical to divide *c* the larger force into two halves and place them immediately next to $\frac{d}{2}$. The small force *e* is frequently put on the outside, as it is not sufficient to affect the beam or pin seriously and only enlarges the span of beam, that is, length of pin or distance between supports $\frac{d}{2}$ thus greatly increasing the bending-moment. This arrangement is shown in Figure 180. Here we have a beam supported at two points $\frac{d}{2}$ with a free end carrying load *e*; the beam being loaded with three loads, two each $= \frac{c}{2}$ and one $= b$.

[1] Continued from No. 740, page 138.

To calculate the bending-moment at any point of this pin we have to consider the end of pin farthest from *e* as built in solidly (and after getting reactions) we should multiply all the forces to the right or left of the point into their distances from the point. If we select the forces on the right we deduct the sum of the moments of those (right hand forces) acting in one direction from the sum of the moments of those (right hand forces) acting in the opposite direction, the difference will be the bending-moment at the point. To check the calculation we take all the forces on the left side of the point. But the reactions will not be $\frac{d}{2}$ each as shown in the table unless *e* were divided and one-half put at each end of pin.

Pin with Unsymmetrical Strains.

In every case of pin calculation, excepting where the forces form simple beams, as in Figure 179, the forces are supposed to act through their central axes, that is through a line drawn at half the thickness of their heads and at right angles to the pin. The heads are frequently thickened up, that is, made thicker than the rod or flat bar, in order to get the necessary bearing surface on the pin, but it will be readily

Forces act through Central Axes.

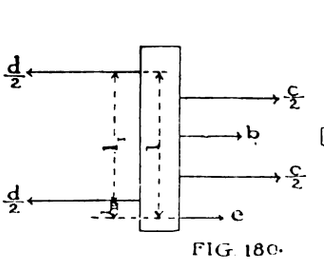

FIG. 180.

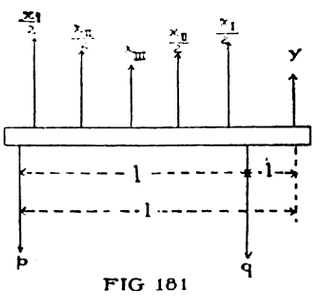

FIG. 181.

seen that this lengthens the pin greatly, thus largely increasing the bending-moments. It is better, as a rule, to get the extra bearing surface by dividing the rod or flat bar into two or more parts and then distributing them along the pin symmetrically and at the most favorable points to avoid bending-moment.

Forces arranged Unsymmetrically.

If the pin is arranged as shown in Figure 180 and we call the different lengths along the pin, as shown, *l*, l_1 and l_{11} the reaction nearest *e* will be

$$= \frac{c+b}{2} + \frac{l}{l_1} \cdot e$$

and the further reaction will be

$$= \frac{c+b}{2} - \frac{l_{11}}{l_1} \cdot e$$

In practice, however, *e* would probably be so small and the convenience so great in making the two bars $\frac{d}{2}$ alike, that the unequal stresses caused by *e* in the two $\frac{d}{2}$ would probably be overlooked. But in calculating the bending-moment on pin, they will have to be considered as unequal, otherwise, the bending-moments calculated from the right hand or left hand of any point would not agree.

To put the above in formulæ we should have the following:

If a pin *p q* is strained by a number of forces x_1, x_{11}, etc., in one direction, the forces *p* and *q* in the opposite direction will equal the reactions of a beam, see Formulæ (14, 15, 16 and 17).

If a single force *y* is placed beyond one of these resisting forces (say *q* Figure 181) the *additional reaction* on the nearer force (*q*) will be

Nearer Reaction Force.

$$q_1 = + \frac{l}{l_1} \cdot y \qquad (116)$$

and on the further force

Further Reaction Force.

$$p_1 = - \frac{l_{11}}{l_1} \cdot y \qquad (117)$$

or, we must add q_1 to *q* and substract p_1 from *p* to get the real strains or reactions in the tie-rods *p* and *q*.

Where q_1 = the strain, in pounds to be added to nearer strain *q* owing to force *y* being placed on the (*q*) nearer free end of pin.

Where p_1 = the strain, in pounds, to be deducted from further strain *p* owing to force *y* being placed on the other further free end of pin.

Where *q* = the force (reaction) at *q*, in pounds, resisting the forces x_1, x_{11}, etc., (see Formulæ 14, 15, 16 and 17) and to which q_1 must be added.

Where *p* = the force (reaction) at *p*, in pounds, resisting the forces x_1, x_{11}, etc., (see Formulæ 14, 15, 16 and 17) and from which p_1 must be deducted.

Where x_1, x_{11} = the forces, in pounds, acting in opposite direction to *p* and *q*, and all projected to line *p* and *q* as shown in Figure 177.

Where *l*, l_1, l_{11} = the respective lengths, or distances, in inches, measured along pin, from *centre lines to centre lines* of respective pins, as shown in Figure 181.

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As the forces x_i, x_{ii}, etc., should *always*, if possible, be located along pin to make the resisting forces p and q even, which is done by putting the smallest force (x_{iii}) in the middle and dividing the others, we should have, *where this is the case:*

Nearer Reaction Force. $$q = \frac{\Sigma . x}{2} + \frac{l}{l_i} . y \qquad (118)$$

Further Reaction Force. $$p = \frac{\Sigma . x}{2} - \frac{l_{ii}}{l_i} . y \qquad (119)$$

Where Σx = the *sum* of all the opposing forces (x_i, x_{ii}, x_{iii}, etc.,) to and between p and q, in pounds, provided that they are divided and the halves or fractions located symmetrically with respect to p and q.

Where p = the *total* resisting force (reaction), in pounds, or strain on p, the reaction furthest from free end.

Where q = the total resisting force (reaction), in pounds, or strain on q, the reaction next to free end.

Where l, l_i, l_{ii}, and y = same as in Formulæ (116 and 117); of course, all the forces must be projected to one line as shown in Figure 177.

If one of the forces, x_i, x_{ii}, etc., were $= y$ and were placed to the left of p (Figure 181) the forces p and q would be equal and each = one-half of the sum of all the other opposing forces, provided always that the forces x_i, x_{ii}, etc., are symmetrically located in respect to p and q. Where there are a number of forces on both sides of pin, the pin might be treated as a continuous girder (see Table XVII, Volume I), but the calculation would become very difficult and the parts of all rods (or compression piece) acting in the same lines and direction would become very irregular.

Locate Forces Symmetrically. It is customary, therefore, to locate the forces along the pin symmetrically, regardless of their true resistances as they would be if treated as continuous girders, and to consider, that each takes its *proportionate load* (according to the thickness of its head) of the whole load along its respective line and direction. In each case it will require special study to obtain the most economical arrangement.

An example will more fully illustrate the method of calculating pins.

Example IV.

Calculation of Pin-Joint. *The joint A of a pin-connected wrought-iron truss is strained by the following members: The tie-rod* $B = -28000$ *pounds: the tie-rod* $C = -70000$ *pounds; the strut* $D = +20000$ *pounds; and the tie-rod* $E = -88000$ *pounds. All as shown in Figure* 182; *design the joint.*

We will assume that for certain reasons we wish to use a $2\frac{3}{4}''$ diameter pin. Now the first thing to do is to settle the thickness of

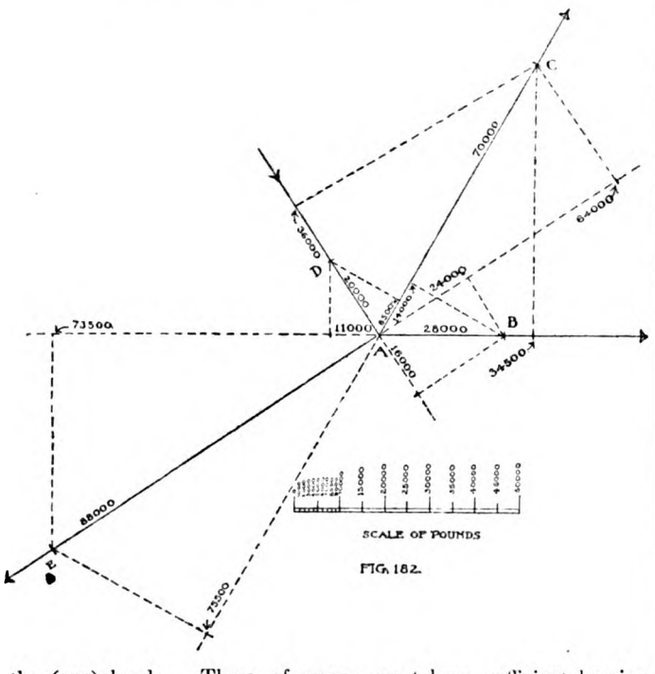


FIG. 182.

the (eye) heads. These, of course, must have sufficient bearing against pins not to crush the pin or be crushed by it. We use therefore the following formula:

Thickness of Heads. $$t = \frac{s}{d.\left(\frac{c}{f}\right)} \qquad (120)$$

Where t = the necessary thickness of eye-bar head, in inches.
Where s = the strain on each eye-bar, in pounds.
Where d = the diameter of pin, in inches.
Where $\left(\frac{c}{f}\right)$ = the safe-compression stress, per square inch, of the material of eye-bar or pin (whichever is the weaker in resisting crushing should be used.)

Accordingly we should have for thickness of the different eye-bar heads in our example the following:

$$A\,B = \frac{28000}{2\frac{3}{4}.12000} = 0{,}85 \text{ or say } \tfrac{3}{4}''$$

$$A\,C = \frac{70000}{2\frac{3}{4}.12000} = 2{,}12 \text{ or say } 2''$$

$$D\,A = \frac{20000}{2\frac{3}{4}.12000} = 0{,}6 \text{ or say } \tfrac{5}{8}''$$

$$A\,E = \frac{88000}{2\frac{3}{4}.12000} = 2{,}67 \text{ or say } 2\tfrac{3}{4}''$$

The values for above thicknesses have been rather too broadly rounded off, but this is done to simplify the subsequent calculations.

Thickness by Table XXXVI. Had we used Table XXXVI we should have had the same results. For $A\,B$ (28000 pounds) the horizontal line $2\frac{3}{4}''$ and vertical line 28000 (from *above* for iron) meet between the heavy bearing lines $1\frac{7}{8}''$ and $\frac{7}{8}''$, for convenience, however, we will call it $\frac{3}{4}''$ though this should not, of course, be done in a real calculation.

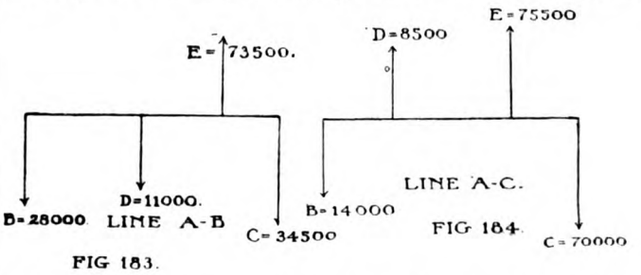
For $A\,C$ (70000 pounds) horizontal line $2\frac{3}{4}''$ and vertical line 70000 from above (the second to the right of 68000) meet just beyond the $2''$ heavy bearing line. It should be, therefore, a little over $2''$ thick, but we will call it even $2''$.

For $D\,A$ (20000 pounds) the horizontal line $2\frac{3}{4}''$ and vertical line 20000 from above, meet between heavy bearing lines $\frac{9}{16}''$ and $\frac{5}{8}''$, we will call it $\frac{5}{8}''$.

To find $A\,E$ (88000 pounds) which is larger than $A\,C$, we shall evidently have to divide it in halves, and, of course, double the result. We find that horizontal line $2\frac{3}{4}''$ and vertical line 44000 from above, meet between the heavy bearing lines $1\frac{5}{16}''$ and $1\frac{3}{8}''$, or we will say $1\frac{3}{8}''$; this doubled or $2\frac{3}{4}''$ is the required thickness therefore, for head $A\,E$.

Of course, if we use more than one bar for either of the strains we will divide the required thickness of head accordingly. Thus, if we decide to use two bars along the line $A\,C$, each would be strained $= \frac{70000}{2} = 35000$ pounds, and the thickness of head required for each would be only $= \frac{2{,}12}{2} = 1{,}06$ or say $1''$.

Arrangements of Heads along Pin. Now to arrange the different heads along the pin, we first lay off along each line (Figure 182) the amount of strain (measuring all at the same scale) and project these strains on to the different lines. We measure these projections and have along the line $A\,B$ the strain $A\,B = 28000$ pounds pulling to the right; the projection of $A\,C = 34500$ pounds

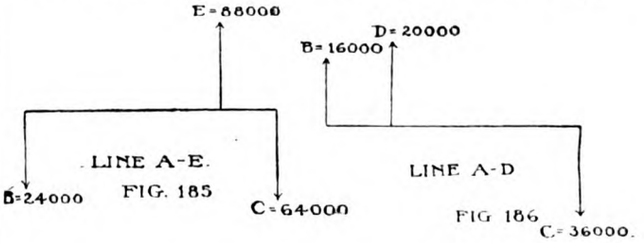


also pulling to the right; also the projection of $D\,A = 11000$ pounds pushing to the right; the projection of $A\,E = 73500$ pounds pulling to the left, thus opposing the other three.[1]

If our measurements are right the sum of the forces acting in one direction along line $A\,B$, must equal the sum of their opponents, or, $A\,B + A\,C + D\,A = A\,E$ and we have in effect,

$28000 + 34500 + 11000 = 73500$

The strains on the pin along line $A\,B$ are shown in Figure 183. Those along line $A\,C$ are shown in Figure 184 and those along $A\,E$



are shown in Figure 185; it will be noticed that in the latter case $D\,A$ becomes $= O$. In Figure 186 are shown the strains along $D\,A$, in this case $A\,E$ becomes $= O$.

Design for largest Strain first. As the largest strain in one direction (88000 pounds) is along line $A\,E$, we will select Figure 185 to design the joint and when we have settled the arrangement of heads along the pin to suit these strains, we will see how it affects the pin according to the strains along the other lines.

The simplest arrangement of the parts would be evidently that shown in Figure 185. We will first consider the shearing. The

[1] These figures have been rounded off to simplify the calculations.

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largest shearing strain will be between C and E and will be = 64000 pounds. From Table XL we find for wrought-iron, single shear (at 8000 pounds per square inch) that we should need a $3\frac{3}{16}''$ diameter pin to resist 64000 pounds single shear (as each of the vertical spaces at the top evidently represent 10000 pounds), we must pass down vertically not quite half-way between the second and third lines to the right of 50000, till we strike the single shear iron curve and then pass along the horizontal line to the left to find diameter of pin, which is between $3\frac{1}{8}''$ and $3\frac{1}{4}''$ or say $3\frac{3}{16}''$. Had we calculated arithmetically we should have had, area of cross-section required from Formula (7) transposed

Shearing strain too great.

$$a = \frac{64000}{8000} = 8 \text{ square inches.}$$

By referring to a table of areas of circles, or by calculation we find that for an area of cross-section of 8 square inches we require a diameter of $3\frac{3}{16}''$. This is a larger pin than we want to use and besides seems a very large pin for the strains; it is evident, therefore, that our heads are badly arranged along the pin; we will decide, therefore, to divide the rods E and C each in two parts, making each head one-half the thickness as above found, and arrange them as shown in Figure 187.

Now the safe cross-shearing on our pin ($2\frac{3}{4}''$) for single-shear would be from Table XXXIX = 47600 pounds, we pass along horizontal line $2\frac{3}{4}''$ till we strike iron single-shear curve and then pass upward about four-fifths way between the third and fourth vertical lines to the right of 40000; as each space is evidently 2000 pounds, we should have $40000 + 3\frac{1}{5}.2000 = 47600$ pounds. By calculation we should have had area of $2\frac{3}{4}''$ circle = 5,939 square inches, therefore safe (single) cross-shearing see Formula (7) = 5,939.8000 = 47512 pounds. The greatest cross-shearing strain on the pin with arrangement as shown in Figure 187 is 44000 pounds, and is between the heads E and C (or E_1 and C_1), so that we need not fear shearing.

Shearing from Table XXXIX.

The shearing area of pin being all right we now consider the bending-moment. We have marked along the pin, Figure 187, the thicknesses of heads, the length of pin required being $5\frac{1}{2}''$, to this must be added the head and nut and also sufficient for strut D ($\frac{5}{8}''$) which we remember did not come into the calculation along line $A\,E$ (Figure 182.)

Bending-moment on pin.

Immediately under the pin, Figure 187, we have marked the distances from centre to centre of heads, which are, of course, the

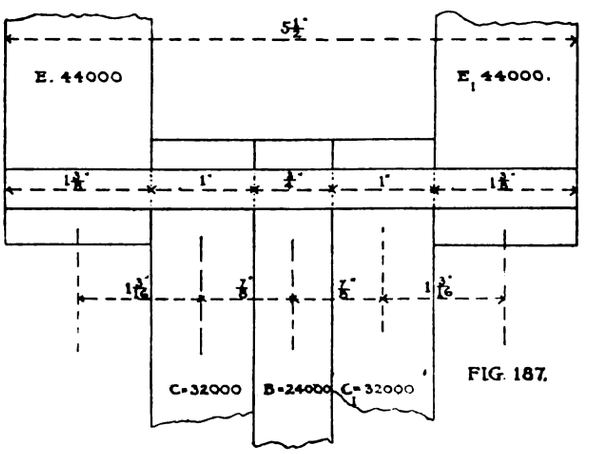

FIG. 187.

distances we consider when calculating the bending-moment. Accordingly our pin becomes a circular wrought-iron beam of $2\frac{3}{4}''$ diameter, with a span or length of $4\frac{1}{8}''$ and supported at both ends by forces E and E_1. The beam is loaded with the forces C, C_1 and B as shown in Figure 187.

The greatest bending-moment will be at the centre (See p. 51, Vol. I), and will be

$$m_B = 44000.\ (1\tfrac{3}{16} + \tfrac{1}{8}) - 32000.\tfrac{1}{8} - 24000.0$$
$$= 90750 - 28000 - 0$$
$$= 62750 \text{ pounds-inch.}$$

This will be much more than the pin can stand for we have, for the safe bending-moment on a $2\frac{3}{4}''$ pin, moment of resistance

$$r = \tfrac{1}{4}.\ (1\tfrac{3}{8})^3 = 2{,}042$$

(Table I, Section No. 7) and from Formula (18) transposed, the safe bending-moment on pin

$$m = 2{,}042\ .15000$$
$$= 30630 \text{ pounds-inch}$$

or, only about one-half of the actual bending-moment. Had we used Table XXXIX instead of calculating arithmetically we should have passed along the horizontal line $2\frac{3}{4}''$ till we struck the dotted bending-moment curve for wrought-iron at 15000 pounds and then passed vertically to the *bottom*. This would be about two-fifths way between the vertical lines 30000 and the first one to its right, each space being evidently 1500 pounds, this would mean 30600 pounds-inch safe bending-moment on a $2\frac{3}{4}''$ pin.

Bending-moment from Table XXXIX.

It is evident, therefore, that we must re-arrange the rods, trying to get the span between loads E and E_1 shorter if possible.

We now try the arrangement shown in Figure 188, placing load B at one end. The arm end B of pin now becomes a lever and we know from Formulæ (118 and 119) that the reactionary forces E and E_1 can no longer be equal.

Try new arrangement.

From Formula (118) we have

$$E = \frac{32000 + 32000}{2} + \frac{4\frac{7}{16}}{3\frac{3}{8}}.24000$$
$$= 63555$$

From Formula (119) we have

$$E_1 = \frac{32000 + 32000}{2} - \frac{1\frac{1}{16}}{3\frac{3}{8}}.24000$$
$$= 24445$$

As a check the sum of the two should equal the whole strain $A\,E$ and we have in effect $63555 + 24445 = 88000$.

This arrangement must evidently be abandoned as a bad one, for the difference in the strains on E and E_1 is altogether too great to

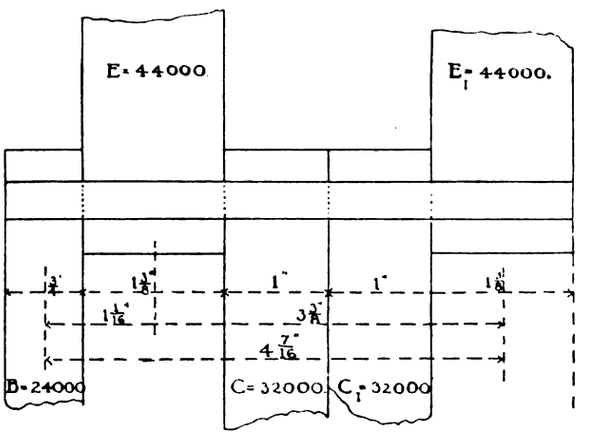

FIG. 188.

be overlooked. Besides, we can readily see that the moments at E and C_1 will exceed 24504 pounds-inch, the safe bending-moment on this sized pin.

For practice, however, we will figure out the bending-moments; they are: at E

(left side) $m_E = 24000.\ 1\frac{1}{16} - 63555.0$
$= 25500$ pounds-inch.

Check (use right side)
$m_E = 32000.\ 2\frac{3}{16} + 32000.\ 1\frac{3}{16} - 24445.3\frac{3}{8}$
$= 25500$

At C we should have:
(Left side) $m_C = 63555.\ 1\frac{3}{16} - 24000.\ 2\frac{1}{4}$
$= 21472$

Check (use right side)
$m_C = 24445.\ 2\frac{3}{16} - 32000.\ 1$
$= 21472$

At C_1 we should have:
(left side) $m_{C_1} = 63555.\ 2\frac{3}{16} - 24000.\ 3\frac{1}{4} - 32000.\ 1$
$= 29027$

Check (use right side)
$m_{C_1} = 24445.\ 1\frac{3}{16} - 32000.\ 0$
$= 29027$

Had we used rule given on p. 51, Vol. I, we should have known that the greatest bending-moment was at C_1. In applying the rule to this case the end load B should be deducted from the nearer reaction to B.

We might next try dividing the force B in two halves of 12000 pounds each, (heads $\frac{3}{8}''$ thick), leaving one at B and placing the other to the right of E_1. This will restore equality to the forces E and E_1, but it will be found that even this arrangement will not do, as the bending-moment at C or C_1 will still be found to be too large, namely, = 27500 pounds-inch.

After these numerous failures it is evident that we cannot well arrange the heads satisfactorily along the pin, unless we enlarge the pin, or else divide up the larger forces which cause us most trouble. We decide to do the latter and divide $A\,E$ into four parts of 22000 pounds each, with heads each $\frac{2{,}67}{4} = \frac{11''}{16}$ thick.

Divide largest force.

We now arrange the heads as shown in Figure 189. The correct way to calculate the bending-moment would, of course, be to consider the pin as a continuous girder running over four supports. This would make E_1 and E_{11} much larger than E and E_{111}. Their heads would therefore have to be thickened so as not to crush the pin, or be crushed by it. It can readily be seen that were we to do this, the calculation would be almost interminable. Besides, practically, it would be expensive to use so many different sizes of rods, heads, etc. We must, therefore, assume that all the forces E, E_1, E_{11} and E_{111} are equal. This they will be, too, for as soon as E_1 and E_{11} tend to take more load, they will stretch under the added tension, and this stretching will

Forces will equalize themselves.

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bring the pin to bear more heavily on the ends and thus the strains will even themselves up.

The bearing of these heads against the pin we know are all right, also the shearing, as the greatest shearing under this arrangement

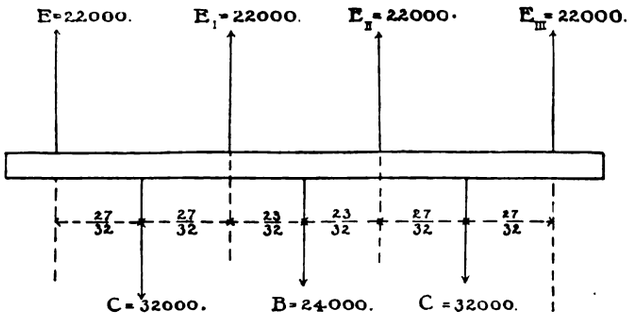

FIG 189.

will be a single shear, between E and C (or E_{III} and C_I) and equal 22000 pounds, or considerably less than half the safe single shearing on this pin, which we previously found to be 48000 pounds.

The bending-moments on the pin will now be, at C:

(Left side)

$$m_C = 22000.\tfrac{27}{32} - 32000.0$$
$$= 18563 \text{ pounds-inch.}$$

Check (use right side)

$$m_C = 22000.\left(\frac{27+73+127}{32}\right) - 24000.\tfrac{50}{32} - 32000.\tfrac{100}{32}$$
$$= 18563 \text{ pounds-inch.}$$

At E_I we should have:

(Left side)

$$m_{E_I} = 22000.\tfrac{54}{32} - 32000.\tfrac{27}{32}$$
$$= 10125 \text{ pounds-inch.}$$

Check (use right side)

$$m_{E_I} = 22000.\left(\frac{46+100}{32}\right) - 24000.\tfrac{23}{32} - 32000.\tfrac{73}{32}$$
$$= 10125 \text{ pounds-inch.}$$

At B we should have:

(Either side)

$$m_B = 22000.\left(\frac{23+77}{32}\right) - 32000.\tfrac{50}{32}$$
$$= 18750 \text{ pounds-inch.}$$

At the ends, of course, there would be no bending-moment, for take end E we should have:

$$m_E = 22000.\left(\frac{154+100+54}{32}\right) - 32000.\left(\frac{127+27}{32}\right) - 24000.\tfrac{77}{32}$$
$$= 0$$

This arrangement (Figure 189) is therefore satisfactory, so far at least as the strains along the line $A\ E$ are concerned.

Examine along other lines.

We must now see if it will answer as well for the strains along the other lines (See Figure 182). The direction we shall now have to fear most, will be along the line $D\ A$ for force D must be placed entirely on the outside edge of pin (not having been located yet) and being quite large,

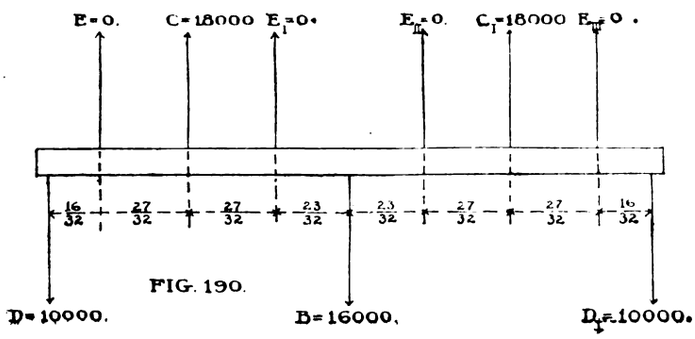

FIG. 190.

20000 pounds, may make us some trouble. In Figure 190 we have drawn the forces arranged the same as we settled on last (in Figure 189) but have added the two forces on the extreme ends D and D_I each $= \frac{D\ A}{2} = 10000$ pounds. It will be noticed that along this line ($D\ A$ Figure 182) the forces E and C are in the same direction. We have divided D into two parts for two reasons. Had we placed it entirely to one side, say to the right of E_{III}, the distance $E_{III}\ D_I$ would have been one-quarter of $\frac{1}{8}''$ larger or $= 3\frac{1}{2}''$; the leverage of D_I therefore at C_I would have been $\frac{27+21}{32} = 1\frac{1}{2}''$ and the bending-moment

$$m_{C_I} = 1\tfrac{1}{2}.\ 20000$$
$$= 30000 \text{ pounds-inch, too much for our pin.}$$

Besides were we to calculate C and C_I by Formulæ (118 and 119) we should find all strain on C removed and C_I more than doubled. This evidently would not do, without special provision to meet the unequal strain by increasing C_I, which would lengthen the pin, so that we prefer to divide $D\ A$, making each head of half the thickness, or $\frac{5}{16}''$ thick. The largest shearing will be between D and C (or D_I and C_I) and equal 10000 pounds single cross-shear or about $\frac{1}{5}$ only of the safe resistance to shearing.

The bending-moments will be (Figure 190) at C.

(Left side)

$$m_C = \tfrac{43}{32}.10000 - 18000.0$$
$$= 13437 \text{ pounds-inch.}$$

Check (right side).

$$m_C = \tfrac{143}{32}.10000 + \tfrac{50}{32}.16000 - \tfrac{100}{32}.18000$$
$$= 13437 \text{ pounds-inch.}$$

and at B

(Either side)

$$m_B = \tfrac{23}{32}.10000 - \tfrac{50}{32}.18000$$
$$= 9375 \text{ pounds-inch.}$$

The bearings, of course, are safe, as the thickness of head was originally determined by the largest strain on each rod along its own line. So that we are all right with our pin for strains along line $D\ A$.

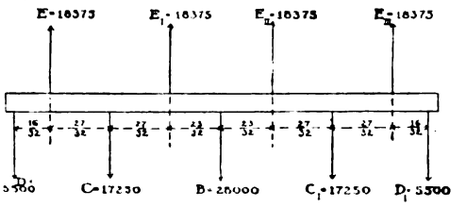

FIG. 191.

We now take up the strains on the pin along the line $A\ B$, Figure 182, which will be as shown in Figure 191.

The greatest shearing-strain here will be caused by B, and will be a double shear of 28000 pounds, or 14000 pounds on each area, perfectly safe on our size of pin ($2\frac{3}{4}''$). The moments will be:

At E

(Left side)

$$m_E = \tfrac{1}{2}.5500 - 18375.0$$
$$= 2750 \text{ pounds-inch.}$$

Check (right side)

$$m_E = 5500.\tfrac{170}{32} + 17250.\left(\frac{27+127}{32}\right) + 28000.\tfrac{77}{32} - 18375.\left(\frac{54+100+154}{32}\right)$$
$$= 2750 \text{ pounds-inch.}$$

At C:

(Left side)

$$m_C = 18375.\tfrac{27}{32} - 5500.\tfrac{43}{32}$$
$$= 8113 \text{ pounds-inch.}$$

Check (right side)

$$m_C = 18375.\left(\frac{27+73+127}{32}\right) - 5500.\tfrac{143}{32} - 17250.\tfrac{100}{32} - 28000.\tfrac{50}{32}$$
$$= 8113 \text{ pounds-inch.}$$

At E_I:

(Left side)

$$m_{E_I} = 18375.\tfrac{54}{32} - 5500.\tfrac{170}{32} - 17250.\tfrac{27}{32}$$
$$= 4422 \text{ pounds-inch.}$$

Check (right side)

$$m_{E_I} = 18375.\left(\frac{46+100}{32}\right) - 28000.\tfrac{73}{32} - 17250.\tfrac{73}{32} - 5500.\tfrac{143}{32}$$
$$= 4422 \text{ pounds-inch.}$$

At B:

(Either side)

$$m_B = 18375.\left(\frac{23+77}{32}\right) - 17250.\tfrac{50}{32} - 5500.\tfrac{23}{32}$$
$$= 14484 \text{ pounds-inch.}$$

So that the arrangement of heads along pin is all right so far as strains along line $A\ B$ (Figure 182) are concerned.

We finally examine for the strains along line $A\ C$ and have strains

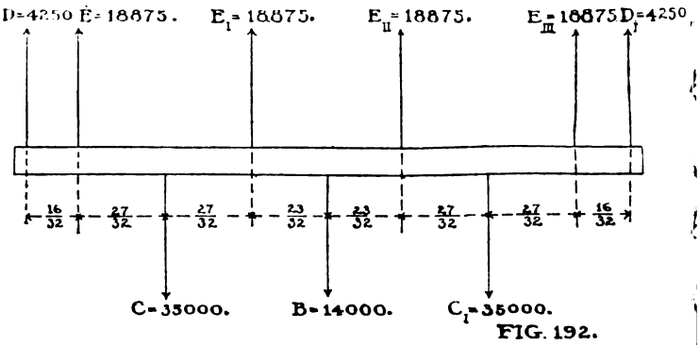

FIG. 192.

on the pin accordingly as shown in Figure 192. The greatest shearing here will be between E and C (or C_I and E_{III}) and will be

$$= 4250 + 18875 = 23125 \text{ pounds,}$$

single shear, still, less than one-half of the safe single-shear on the pin.

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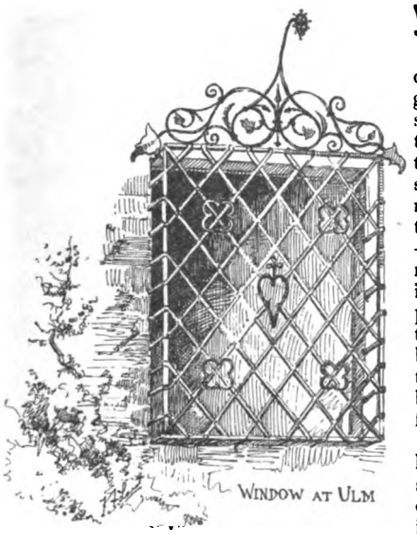
By calculation the moments will be found to be at the different points, as follows:

$m_E = 2125$ pounds-inch.
$m_C = 21637$ pounds-inch.
$m_{E1} = 11617$ pounds-inch.
$m_B = 16648$ pounds-inch.

So that this arrangement of the different bars and strut along the pin is in every way satisfactory. LOUIS DECOPPET BERG.

[To be continued.]

CAST-IRON AND ITS TREATMENT FOR ARTISTIC PURPOSES.[1]



WINDOW AT ULM

THE easy contempt we feel for iron is the direct result of our treatment of it for gain, and not for true service. Yet sentimentality — and all art has to find out the intrinsic sentiment of phenomena, and so interpret them in an exalted form — there is a certain mysterious appeal in iron only surpassed probably by the gold of the poets, with its red bloom; and so pure as to be "soft as wax"; barbarous, occult and fateful.

Iron, on the other hand, stands for strength, simplicity, even severity, and, on its sinister side, for cruelty and terror. In the old apportionment of the seven metals to the seven planets, iron belongs to Mars, as gold to the sun and silver to the moon; and Chaucer rears his Temple of Mars on iron pillars of the diameter of a barrel and polished.

> "Every pillar the temple to sustain.
> Was ton-great, of iron bright and shene.
> There saw I first the dark imagining
> Of felonie, and all the compassing."

Dante, too, builds of it, . . . "the moats profound. That circumvallate that disconsolate city." We are not conscious of any mean reflection or association, but rather an exaltation of the imagination, when, in the curious myth of Mahomet's coffin, we are told that it was of iron, sustained in the air by the equal attraction of the walls, ceiling and floor, which were of loadstone; or in another Eastern tale, "The City of Brass," where it says that an inscribed tablet of iron of China was suspended in front of the "Terrible Tomb." We feel that bronze, or even gold, would be an anti-climax. In the image interpreted by Daniel, iron stands for power: "Strong as iron: forasmuch as iron breaketh in pieces and subdueth all things," and "wherein (as says the Koran) is mighty strength for war." To come to actual instances. When, in the fourth century, a great Indian Rajah set up the pillar of Delhi at the true centre of the round world, to commemorate, as the inscription reads, having "obtained with his own arm an undivided sovereignty over the earth," the great shaft of iron was made which, still undecayed, forms one of the oldest of Indian records. The iron crown of Lombardy, or the cross of Germany, are further instances in which the mere name of the metal lends a mysterious and moving import of invincible sternness.

The highest art is to concentrate the powers for one premediated appeal to stimulate the imagination, and for this the quality of inherent sentiment of the material is not the least of the formative factors; as the Egyptians knew well when they selected black basalt for their statues, and the Hindoos, again, when in some of their temples they used great beams of iron, not as mean, but precious things. And Pliny, when he tells us of a certain statue of cast-iron, says that it was chosen as appropriate to the subject — a Hercules.

As our sensibility widens and deepens, we shall find that not a given material — the whitest marble or the greenest bronze are necessarily artistic — but the intellectual or intuitive grasp by which material and motive, texture and technique, are made to coördinate in one balanced and adequate result. And thus stern iron might offer, in the hands of a master, a material of great value in serious and commanding work; indeed, on the plane of the highest sculpture, we can only think one man's work into iron, and that man the greatest artist of them all. We might, perhaps, be allowed to recommend to the rising new school of English sculpture sometimes to think away from the, perhaps, petty prettiness of bronze to *think* sometimes in iron.

Having once made this claim for iron to a place in serious art, my actual examples will be of much lower range and humbler intention. Waiving this possibility of the highest appeal, and selecting iron because of its commonness and powers of resistance, it has been treated as an art "not too great and good for human nature's daily food," but still an art real of its kind. By a careful selection of the forms and treatment suited to the structure and texture of the material, and its application to commonplace needs, the charms of fitness and honest simplicity have been given to it, and, by accepting the comparative valuelessness of the metal, it has been used as the vehicle for slight thoughts and slighter execution. It should not be without result that by far the greatest of our designer-sculptors, the late Alfred Stevens, worked long and thoroughly as a modeller for cast-iron, from no choice of his own, it may be, nor choice, probably, of subject; and yet by far the most popular work of modern sculpture, the little lions on the outer rail of the British Museum, of which so many other artists are glad to keep casts by them as examples of breadth and style, are only cast-iron. That they should be painted such a repellent color is but an accident of their fate — the irony of fate. The torch-holders on the top of the same screen, with reliefs of heads surrounding the bowls, are also his. Table-supports, stoves and grates also occupied his care. Some of them are described in Mr. Armstrong's book, and a specimen may be seen in Chelsea Town-hall.

At South Kensington, in the buildings on the west side of the road, there are two well-modelled dogs, modern French work, bronzed on the surface; and in the Museum of the School of Mines, in Jermyn Street, there are several works, statues and other dogs, after the antique, as well as modern work. One of these is especially interesting, for it is shown as it came from the mould, with seams, jets and supports not cut away, nor any surface-chasings. At a doorway at the west end of Conduit Street stand another pair of dogs in iron. Many of the firebacks which we shall notice later are low-relief sculptures of considerable merit, especially that at Bruges, which has two nude figures, some 3 feet 6 inches high, as supporters to a shield.

The invention of casting in iron seems to have been made very early. Pausanius says of Theodorus of Samos — a sort of antique Cellini, to whom they appear to have ascribed most wonderful works in metal, and who is supposed to have lived in the sixth century B. C. — that he cast figures of iron; and both this writer and Pliny mention other statues of this material. An Etruscan statue and a head of Roman work are said still to exist. England, we know, was extensively worked for iron by the Romans, and vast cinder-beds have been found near Buxted, in Sussex, with scraps of pottery and coins of Nero, Vespasian and Diocletian. Iron rings formed the currency of the natives when Cæsar "came, and saw, and conquered."

There is, however, I believe, no evidence to show that casting iron was practised here before the Middle Ages, nor at what time it was then introduced. M. Viollet-le-Duc, who, more than any one, knew the history of mediæval crafts in France, does not mind supposing that it was known there in the thirteenth century, to which date he attributes a fragment at St. Denis. In the fourteenth century, cast-iron artillery was probably founded all over Western Europe, and it is likely enough that this may have introduced the furnaces into Sussex, in spite of the couplet which says:

> "Master Huggett and his man John
> They did cast the first Cannon."

Magnificent bronze sculptures, we know, were cast here in the thirteenth century by Torelli, the artist of the lovely Queen Eleanor's tomb at Westminster Abbey.

If so introduced with artillery, the founders soon cast other objects. There are in the churches of the counties of Sussex and Kent a large number of grave-slabs, the earliest of those known being at Burwash. From the form of the cross and the Lombardic lettering, it is almost certainly a work of the fourteenth century. Mr. Lower, the writer of an able paper, from the historical side, in the second volume of the *Sussex Transactions*, gives this date. He says the inscription is a good deal injured, but reads:

> ORATE. P. ANNEMA
> JHONE COLINS

The placing of this on the plain field of the slab is full of art, and characteristic of early taste. . . .

In the great open fireplaces where logs burned on the hearth of hall and kitchen, cast-iron slabs, called firebacks, were put against the wall behind the fire. They are found alike in France, in the Low Countries and in England, and invariably charged with some device, arms, inscription, badge or a scene Scriptural or Classic, an allegory or a fable — something to suggest a thought, as the pattern adorned the opening in summer, or burnt red-hot behind the winter fire. All these things were books.

One of the largest and best in the modelling is that at Bruges before-mentioned, with figures of nude savages, gentle as Rousseau's natural man, supporting a shield. They are too high in relief, but evidently the work of a very good sculptor, and dated 1565. . . .

The latter firebacks are very numerous, although for the most part now in "collections" instead of adorning the cottage hearth or the hall for which they were specially made, for hardly any exact duplicates occur, and in very many instances the arms or an inscription identify the former owner's family. A back at Misfield, in Sussex, is a charming design; at the top in a little gable the crowned

[1] Portions of a paper by W. R. Lethaby, read before the Society of Arts and printed in the *Journal of the Society of Arts.*

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badge and supporters of Elizabeth and five tiny shields, with an inscription —

THOMAS UNSTED ISFIELD AND
DINAS HIS WIF: ANO DOMINI. 1582.

all mixed up, together in amusing confusion of wavering lines of letters. . . .

The most beautiful example known to me is one of which a photograph is kindly lent me by Mr. Longden. A Roman soldier with a long spear, in three-quarter back view, within a margin line which sprouts out flowers and a flowery top and borders; it is a work of very considerable skill, sense of decorative spacing, and a touch unconscious and unaffected. The date, 1746, of this example would probably be later than the original model. Another of "Lord Fairfax" riding, fills the field well; the horse, the attitude, and the flying drapery remind one of the old broad seals on which the design is evidently founded. Another, of which I have the sketch, has for the centre a large apple-tree, with a cavalier and a lady on opposite sides, she offers him a flower — a new Eve. . . .

The actual achievement in the poorest of these firebacks is low enough. Some are, in fact, almost grotesque, but yet they all have that fresh touch of a real motive, a direct reference to some expressive gesture or pleasant object; all treated with great simplicity, and that instinct for balance and spontaneous fitness and freedom in the ornament, without any forcing the material or obtrusive display which is the mark of the traditional crafts. . . .

The firedogs or andirons which accompanied the backs on the hearth make a parallel series. De Caumont and Viollet-le-Duc cite examples of late fourteenth century and early fifteenth century in France; and a sketch I made in the Museum at Angers, of a Gothic example of this date is on the wall; many of later date still carry on the Gothic forms in England; from an arched base, sometimes cusped, springs a stem, which carries a small shield, a capital, or a head; several examples may be found figured in the articles before quoted. They are interesting historically, but are not, I think, the models we should follow. We have seen enough of the "Gothic revival" in cast-iron; what we want is new thought based on practical needs, and the Gothic spirit of a search for beauty untrammelled by formulas. Still later examples of the seventeenth century were figures or "terms," the best designed of which are signed "Carron." I bring here one of these of my own, a small female figure, and show a sketch of a terminal figure of a man which is both larger and better modelled; but even the former, poor example enough as it is in its way, is much better than a far abler sculptor would be likely to give us who did not sympathetically approach the material he was working in, and design within rigid limits; for, first of all, the figure must be just a solid post without weak projections or detail, and in this the old ones, without exception, are successful. Perfectly plain turned vase and baluster forms on a base, or obelisk-like posts on pedestals, were also used, and are probably as appropriate as any. Simplicity alone never fails; it is the charity of design that will cover a multitude of sins. To aspire is well, but to aspire vulgarly and fail weakly is to make art an offence and distaste. . . .

In Sussex the iron trade assumed such large proportions, especially after the introduction of blast-furnaces worked by water-wheels in Queen Elizabeth's reign, that the exhaustion of the timber in the supply of charcoal fuel caused much anxiety, and an effort was made to limit the industry. In 1607, an amusing tract argues the question in dialogue, the upholders of the local trade doing so on purely philanthropic grounds. The clearance of the woods was a benefit to mankind, for "people bred amongst woods are naturally more stubborne and uncivil than in the champion (*sic*) countries." At this time there is stated to have been as many as 140 furnaces in Sussex.

I am not one of those who wish to see in iron a material for a new architecture, as it is called, nor do I wish its extended use, rather inversely a smaller field, but that field as full of flowers as may be. Mr. Ruskin, with that insight which makes him refuse to talk about the fringe of a subject, saw clearly when everybody was clapping their hands over the Crystal Palace, that the finding and founding of iron is not one of the radically nobler employments, as stone hewing and setting is, or the felling and framing of timber. I would echo every word he says. But while we use iron in some degree, while we even need iron, while even it may grow into wider necessary use, I want to say let us lend what grace we may to it, so that if obtained with cost, the greatest of all cost, an unkindly labor, it may not be mispent and more than spoilt, used to insult a trained understanding in the brutality of its vulgar insolence. For in all these things it is human life we spend; there is really no other currency, and so comes the reverence any true worker always feels for material.

Cast-iron was largely used in the pleasant and refined manner of building, from the end of the eighteenth century, the typical London house. In the great area from Paddington to Pimlico, and Bloomsbury to Bayswater, there are an infinite number of examples of a quiet and charming taste. Railings, balconies, verandas, with graceful posts and panels of delicate lattice; or inside the house, the grates and stair balustrades were just as good.

The railings began with the very fine design of the enclosure to St. Paul's; great baluster-shaped forms of beautiful profile; the railings of St. Martin's-in-the-Fields following the same model; and there is a late example in Bloomsbury Square, where large rounded posts of this kind are used occasionally between straight uprights. Others have wide pilaster-posts at intervals, like a beautiful railing close to Apsley House in Piccadilly; or others have solid discs placed in the lozenges of lattice-work, as on the west side of Lincoln's Inn. Even the ordinary area railing of straight bars has cast knobs and vase-like forms on the top, entirely good in their way, and everything so compact that you never see parts fractured.

The balcony railings are very light — a net-work of lattice. For perfect fitness, a natural and unashamed treatment of casting in iron, they could not be bettered. We never think of comparing them with wrought-iron to their disadvantage; both are excellent in different categories, and we might as well compare London Bridge to Lady-day; whereas, modern castings do invite comparisons with wrought-iron, by an infinitely careful ingenuity of pattern-making, emulating just those qualities in which to succeed is only the most of all to fail. For not the line, as in wrought-work, the bent rod in scrolls, but the plate, plain or pierced, is the primary fact, a panel of equally distributed substance, or it will fracture in cooling. To get the most out of these natural aptitudes — that is art, by the simplest means — that is perfect art. In a word, the ratio of visible effort and economy of apparatus to the ends achieved, is the measure of our enjoyment of a work.

The verandas, many of them, are equally excellent, also some of the older lamp-posts. For the stair-railings, the usual plan is to have a wide, flat baluster of open work, one to each step, the metal very thin towards the view, and perhaps beaded. I remember to have seen a wide stone stair of the Town-hall at Cherbourg; there was a continuous balustrade of cast plates of iron, pierced with apertures into forms, each edged all round with a delicate raised fillet; it was certainly successful. The French use cast-iron largely, and much of it designed with better taste than our own, and much, I believe, with worse. Where it is the work of one of their abler architects, as in the St. Geneviève Library, or the Northern Station, or the Palais de Justice, it is carefully studied and refined. Doors are also made of it, especially for tombs, and these are suitable, which cannot be said of the elaborate pair of Berlin castings at South Kensington, which may be taken to exemplify the "thou shalt not" of cast-iron. A sheet of old designs I have also shows arcaded trellises for gardens, of equally reserved taste.

In Italy also, cast-iron has been used for balconies, grilles, and that sort of thing; the turned baluster is a favorite form.

The grates that fill the older houses in London are, for the most part, of excellent design and remarkable examples of careful casting; some are quite plain, with just a moulding or two, and others are fluted and beaded all over with tiny ornament on flat surfaces; the simplicity of the general forms saves the ornament from being worrying. A very beautiful grate of this sort was designed some years since by Mr. Philip Webb. There are also a great number and variety of knockers.

It is interesting to find in the East a school of casting in metals, poles asunder to our own, especially in its appreciation of the iron; there without doubt the abstract and absolute quality of the metal is admired, apart from the mere accident of its comparative cheapness. Japan is particularly famous for its iron workings, but casting is also well-known in China. Some years ago, a chain of cast-iron, of antique Chinese make, was shown at a meeting of the Archæological Association. Bells and many other objects were also known. But the most wonderful works of iron are the sculptured *tsuhi* or sword-hilts of Japan now treasured in the cabinets of collectors all over Europe, as well as in Japan itself, each one of tens of thousands a marvel of design and skilful handicraft. Iron has been also largely used as a basis for incrusting other colored metals upon in raised designs, but those works that especially belong to us this evening are the cast-iron tea-kettles and vases, of which great numbers have been brought to England, every one a truly individual work of art, fresh in design, and a wonderful example alike of casting, of decorative sense, surface texture and color. Mr. Phené Spiers has been kind enough to lend me two or three examples. A vase is not so large as some, but an interesting article of workmanship. The kettles are most charming, one with a slightly sketched band or fret ornament, and a surface that artfully reproduces the accidental handling of the wax original. The color, a fine reddish gray, is entirely beyond my knowledge to suggest how it is obtained. The smaller and, I suppose, much earlier example is even more fascinating; about the size and shape of a small glue-pot, with slightly sunk discs, containing inscriptions in soft floating relief, and the surface clean, untouched iron, with all the rough texture of the granular particles.

There are a few examples at South Kensington, a small beast and two kettles. These are damascened in silver, and the lids are of precious enamel, which sufficiently shows that the artist delighted in his iron as a material of special and singular beauty.

Dr. Dresser's book tells us these kettles were modelled in wax on a core and the model was destroyed in the first casting, so that repetition was impossible without remodelling, and who would remodel without variation? The model finished, a thin batter of very fine clay-like sand was mixed with water and spread over the model; a second and other coats of a coarser material followed, and then hard sand was pressed solidly around the whole. When dry, it was put in a muffle and the wax evaporated, the metal afterwards occupying its place, as in the well-known *cire perdue* method, by which the best works of bronze are cast. . . .

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If the uses are not few, the methods of treatment are many. We must, however, accept the necessary limitations that sculpture or ornament must be modelled, not carved, wherever it is proposed that the finished result should be a casting either in metal or other materials. The base may be wood, and the ornament modelled in applied wax, which Viollet-le-Duc has stated to be the old method. The ornament, whatever it is, must be a surface-decoration of a general, simple, structural form.

Repetition is of the very nature of cast-work, and hence the same form as we have seen was often many times impressed in the same mould. Repetition of a few simple elements in different combinations made great actual variety possible, as in the firebacks.

As to surface, rust is without any doubt the natural treatment, and I believe we might well let nature have it so on occasion. Let us suppose a relief good in design, slight in finish, of the best iron, and absolutely untouched from the mould; put up under some simple pent, it will gradually acquire color and texture — too much of both, you think, but I am not sure. Remember, first of all, how frightened we are of beauty, and that natural color and naturally-acquired texture are the very adornments to beauty herself. A joke in Japan tells how the new servant-maid from the country polished off Time's lovely tarnish from a silver vessel "to make it look bright and new." The joke would appear pointless to us, even applied to the tombs of Westminster. Decay is really much less than we suppose, especially on large, rounded surfaces, and with even a small but constant amount of friction the metal keeps free of rust, or probably acquires a weather-skin. Posts that block up roadways (of which there are a good many in Bloomsbury) or the parapet of Westminster Bridge are examples. Internal work, like the finely-designed gratings in Kensington Museum, becomes quite polished.

Galvanizing, the modern version of the tinning, which, applied to iron, is as old as Theophilus, is a valuable process. Galvanizing and good oil gilding right over the surface would probably be a perfect protection, or the galvanizing might be lacquered and varnished in one or many lustrous tints, or in black and gold patterns, like the iron beams of large scales, one of the few simple decorations still done traditionally.

The black of Barff's process is also a valuable method: the Japanese set much store on a black oxide.

Electro-bronzing is another available method of which the French make use, and the dogs at Kensington are examples. Pliny tells us a statue at Rhodes was made of iron and copper for the sake of the color. We find it possible to get Japanese workmen here to furnish out a shilling show. Would it not be possible to get one or two to instruct us in their processes in iron-working, and especially in finishing and coloring the surfaces?

For some work, oiling or varnishing may be sufficient, or thin Berlin black. In many cases, of course, painting is really necessary, for which I would recommend white, gray or black as constant colors, although the real red of the post-boxes is not an example to be followed. Simple black-leading, too, is to be entirely approved.

Some old grates are inlaid in brass, which forms flush-patterns on the surface. Lead might also be suggested, say for patterns and inscriptions on flat slabs, and might be merely beaten into the hollows left in the casting; or even cements and mastics might be so inlaid, if only properly designed. Turning might be used to finish the forms of balusters of severe Classic patterns.

In conclusion, this business of iron-founding is such a vast and important industry for England, that any one might be proud to be engaged in it. A sense of beauty and a reputation for skill are also (but it is a degradation to put it in this form) very marketable commodities. How would it be, do you think, even in this severely "practical" present, while not neglecting necessary commercial conditions, to foster within that a school of art in iron-founding, in which sons of the house, gentlemen in education, should yet be proud to work as artisans. I entirely believe that manufacture in almost any of its branches (to take Napoleon's phrase) would be "a career open to talents," especially now, as we have heard, "the professions are played out." With due training and capability, a reputation and some degree of success is almost certain to be obtained in a craft considered and practised as an art. But even those who make art serve them in some degree do it by trying to satisfy this or that taste in this or that style. They do not, as they should, establish a school of production, with Cellini the founder, Maestro Giorgio the potter, or our own Chippendale the cabinet-maker.

If our prosperity depends on international commerce, beauty is at once the most attractive and cheapest of all inducements, and, with honesty in the wares, the only lasting one. Would it not conserve energy and subserve dignity if advertising were not the only art practised in so many manufactories? If the wares are good, the buyer should be the seeker. All these things are so curiously and closely interwoven, that bad art goes with bad commerce, bad goods, bad society; Belgian cinder girders and riots of Charleroi. It is true in every department of work, of all materials, and of every form of pay, what the Ironmaster said to Emerson: "There's always good iron to be had: if there's cinder in the iron, 'tis because there was cinder in the pay."

DISCUSSION.

The Chairman, Mr. Statham, said: On the question of repetition, and the use of cast-iron ornaments in relief for such objects as firebacks, that was admirable, because you wanted a thick plate of iron there to stand the heat, and *repoussé* wrought-iron would probably not do so. So long as you did not go on multiplying a fireback, and sell it by the gross in order to do it cheap, and so long as you made it when wanted, producing a design which would stand the heat, it was perfectly legitimate art. It was not legitimate when people began to make what they called highly-decorated pieces of wrought-iron, canopies and balconies of a very ornamental kind, and then reproduced them, and boasted that they could let you have these beautiful ornaments at such a low price as compared with wrought-iron. It was a dangerous thing, however, to speak one's mind too freely on these matters, as he had discovered. Some time ago he made some strong remarks about the cast-iron productions of a very large firm, well-known in the North, which went in for ornamental cast-iron mantel-pieces, and centre-pieces with spreading branches, and so on; and he got a letter from the firm, telling him that the next time his advertising-agent came to them for an advertisement he would find out his mistake. With regard to the use of cast-iron in structures, he came across a very remarkable instance of what he called the false use of cast-iron ornament in the roof of Olympia, which he went over with the engineer, who was very proud of his work before it was quite finished. It was a splendid piece of work, and he was much struck with the way in which he had supported the great roof principals on fish-shaped, cast-iron pieces, thicker in the middle and pointed at the top and bottom, where it was in a socket, so that on expansion or contraction it quietly turned as far as was necessary. It looked very elegant, and thoroughly answered its purpose. He remarked to the engineer that that was a new use of iron, when the latter replied that it was not yet finished; there was a Corinthian capital to go round the top. The Corinthian capital had nothing to do with the design or the construction, but it was to be put on because people were in the habit of seeing a capital on the top of a column; and, as the engineer said, they would expect it, and he dared not leave it out. That was a flagrant instance of the way how not to use cast-iron, and the man who did that spoiled the best merit of his own design by trying to do something with it which was not fitted to the material. He was much interested in the statement from Dr. Dresser that the Japanese used the *cire perdue* process in cast-iron, which would, of course, enable finer surfaced-work to be done, and a higher finish in relief-work to be obtained than by casting in sand. He did not quite see his way to adopting the idea of leaving the iron to rust, although it did produce a fine color. He feared the tendency would be to rust too much, and to destroy even the bold design which Mr. Lethaby rightly recommended. He agreed with him that anything was better than paint, though that had to be used in large engineering works, being the only real preservative; but in smaller works he should much prefer some of the other processes which had been mentioned.

Mr. Hugh Stannus, both personally and as a member of the Company of Founders, desired to tender his thanks to Mr. Lethaby for the very interesting and exhaustive manner in which he had treated this subject. He had shown in the historical part of the paper that cast-iron had a dignity and nobility, when properly treated, which too many in the nineteenth century were apt to ignore. The danger in working cast-iron had always been in making it imitate other materials. As he had said on a former occasion, the attempt had been to make it imitate in the first place the forms of wrought-iron, and, secondly, the forms of stone, to neither of which it was suited, and the result was vulgarity. Reference had been made to Stevens and his wonderful little sitting lion; the lion was modelled by Stevens, but it was scarcely his design. It was modelled from a sketch which the late Sidney Smirke made of the pretty little lion on the staircase in the Bargello Palace at Firenze; but Mr. Stevens had put so much of his own feeling into it that it might almost be called a new creation. It was the finest sejant lion ever made. Stevens, in his treatment of iron, might be said almost to be the Mozart of iron. Music had been divided into the pre-Mozart and post-Mozart periods as art was divided into pre-Raphaelite and post-Raphaelite; and so with cast-iron, there was a pre-Stevens and a post-Stevens period. The new inventions and new treatment which Stevens introduced when he went down to an iron and bronze foundry at Sheffield would require an entire lecture to deal with. Some interesting examples had been given of grave slabs, but no reference had been made to that wonderful set at Nuremberg. They were great iron-workers there, and many of the grave slabs were of cast-iron, and very dignified they looked. Firebacks were a very legitimate and very interesting use of the material, and in his rambles about the country he often admired in the cottages those grand old Sussex firebacks. The way in which they showed what Mr. Lethaby called "mystery" was very interesting; and he was reminded of a similar instance in Stevens's work, a cast of which he had lent to the present Stevens's Exhibition at the Royal Academy. It was the back of a stove; the front bars were straight, but the back of the stove was semicircular, and the upper part of that back contained a low-relief of the carrying away of Persephone, which belonged to the Plutonic cycle of myths, and was exceedingly appropriate to such a position. There were the fiery red-hot coals and the smoke going up, and there was old Pluto carrying away Persephone in his chariot down to "hell." Andirons had been spoken of, and there were several splendid examples still existing in Sussex. It was very important, as had been said, in cast-iron, to attend to the sectional area. If there were a thin part it would cool more quickly that the thicker part, and when the other parts cooled it

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would snap. It was very necessary, therefore, in these andirons to make them of similar sectional area, and that accounted for what appeared at first sight a little want of variety in their shape. It was an instance of the law of the survival of the fittest, and the mere fact that so many of these had survived, showed that they had been made in a form consonant with the nature of the material. Allusion had also been made to stove-fronts. In the Adam's period there were delightful little ornaments, either modelled in wax or cast in lead, and bradded on to the wood mould. Some years ago, at the Carron Company's office on Thames Street, the London partner of the firm showed him an old pattern-book, of contemporary date, full of beautiful designs in the Adam style. He entirely agreed as to the absurdity of cast-iron Corinthian capitals where leaves were fixed on to a central core; but it was interesting to note that, as the name implied, this was the way in which the capital was first designed. The Greeks in the Corinthian time, about the third or fourth century B. C., were great workers in brass and bronze, and any article made of this material was called Corinthian brass. Gradually the word "brass" was dropped, and the word "Corinthian" retained; and so what had originally been a Corinthian brass capital became called a "Corinthian" capital, just as Birmingham *brass* candlesticks had come to be called "Birmingham" candlesticks, and Damascus cloth, "damask." This showed, therefore, that originally the leaves of the Corinthian capital were made separately, and applied to the marble core. There were existing some Roman ruins at Baalbec, and one of the temples showed what is called the bell of the capital, with holes round the bell in which the leaves were put on separately, the holes being for the rivets. On the question whether these should be added in external work, he agreed with the Chairman, because they knew that water got into the apertures, and either oxidized the iron, or, in time of frost, burst away the leaves. He would draw attention to some interesting capitals of the general Corinthian shape, designed by Mr. Godfrey Sykes, in one of the arcades at South Kensington, which were entirely cast-iron in their treatment. With respect to rust: it was a good custom to let iron rust as far as it would, and then if it were a small object, to slightly heat it, dip it in oil and brush it. The result was, it would never go any farther; and it acquired a magnificent patina which was a true color of iron. He thought there was one general law for the color-treatment of all metals, that the color should be either that of its crystallization or oxidation. There was only the choice of those two, and he should like all metals to be confined to those two. It annoyed him very much to see iron painted white, green, or vermilion; of course, the post-pillars were painted red, like the postmen's livery, because of the royal scarlet, and because the red was conspicuous, like a druggist's lamp; but, except for some such reason, the color of iron should be confined to that of the fracture — which was a silvery gray — or its oxides. He begged to move a hearty vote of thanks to Mr. Lethaby.

TEMPLES OF ANCIENT MAYA.

WHILE many of the ruined cities of the Mayas, the aboriginal people of Yucatan, are in the southern part of the peninsula and in Guatemala, the portion of the peninsula north of the nineteenth parallel was the locality of densest population, and here some of the most important ruined cities of this ancient and exceedingly interesting race are found. Chief among these is Uxmal, that riva's in the size and beauty of its architectural remains Copan and Palenque.

Uxmal, with its wonderful Casa del Gobernador, its House of the Nuns, its House of the Dwarf, its Casa de Palomas, its House of the Tortoises, and its unnamed pyramid and dilapidated walls, is one of the most interesting ruins of the ancient civilization of Yucatan yet discovered. As indicated by the remaining edifices, the city was about a mile square, but the site and the surrounding country is completely hidden in dense and almost impenetrable forests, which have hitherto prevented any deep explorations. The ruins of Uxmal are remarkable because of the better preservation of the buildings, principal among which is the Casa del Gobernador. It is constructed on the broad top of a triple artificial terrace, that is 575 feet square at the base. The first terrace is but 3 feet high and 15 feet broad. Rising above it is the second, 20 feet high, 250 feet wide and 545 feet long; and the third, on which the building stands, is 19 feet high, 30 feet wide and 360 feet long in front. All are supported by substantial stone walls. The platform of the second terrace originally supported several structures, the character and uses of which are hidden in the darkness of the centuries that have rolled over the country since the builders were active in the construction of the buildings.

The Casa del Gobernador, so called by the Spaniards for want of any other name, was constructed entirely of stone. Up to the cornice the façade presents a smooth surface; above is a solid mass of rich, complicated and elaborately-sculptured ornaments, forming a sort of arabesque. The grandest ornament, which imparts a richness to the whole façade, is over the central doorway. Around the head of the principal figure are rows of hieroglyphics. They differ somewhat from the hieroglyphics found at Copan and Palenque, and are richer, more elaborate and complicated, but of the same character. From their conspicuous position, they undoubtedly contain some important meaning; probably they were intended as a record of the construction of the building, the time and the people by whom it was built.

The building has 11 doorways in front and one at each end. There are no openings in the rear. There are 24 rooms in the structure, two of which are each 60 feet long, one 13 feet and the other 11½ feet wide, one 23 and the other 22 feet high to the top of the arch. The walls are constructed of square, smooth blocks of stone, and on each side of the doorway are the remains of stone rings fixed in the walls with shafts, probably the supports of the doors which have rotted and crumbled to dust. Upon the inner side of the rear wall were seen several prints of a red hand with the thumb and fingers extended, not drawn or painted, but stamped by the pressure of the living hand upon the stone. He who made it had pressed his hand, wet with red paint, against the stone. A striking feature about these hands is that they are exceedingly small. The extended hand of the average American will completely cover the prints upon the wall at Uxmal.

In the south end apartment of the Casa del Gobernador there was found a sculptured beam of sapote wood, which had done service as a lintel over a doorway. It was 10 feet long, 1 foot 9 inches broad and 10 inches thick, and was covered with hieroglyphics. The artistic finish of the sculpture on this beam was superior to any example of this art that had thus far been discovered, and Mr. Stephens, with great difficulty, had it shipped to New York in transit for the National Museum at Washington. But here it was burned in Mr. Catherwood's Museum in 1841, together with a very large and interesting collection of archæological fragments from all parts of the world.

Chief among the structures on the wide area of the second terrace is the Casa de las Tortugas, or Temple of the Turtles, so called from a row of sculptured turtles that ornaments the cornice. The temple is 94 feet in front and 34 feet deep, and is distinguished for its beauty of proportion and simplicity and chasteness of ornament. Little except the massive walls of this building remains. The roof has caved in, and luxuriant forest-trees are growing up from the interior. What use was made of this building has not been discovered. The excavation of its interior was not attempted.

About 240 feet distant from this building, in a northerly direction, are two ruined edifices facing each other, 70 feet apart. Each is 128 feet long and 30 feet deep. They appear to have been exactly alike in plan and ornament. The confronting sides were embellished with sculpture, and there is still visible the fragments of entwined colossal serpents, which ran the whole length of the walls. In the centre of each façade, at points directly opposite each other, are the fragments of stone rings, 4 feet in diameter each, fastened in the wall by stone tenons of corresponding dimensions. Neither of these structures has either doorway or window, or any form of opening. They are merely four great walls, filled-up with stones and earth, and for what purpose they were built is still merely conjectural. The court between the buildings was evidently used as a gymnasium and for athletic sports.

Still farther north is the Casa de las Monjas, or House of the Nuns, the second in size and importance of the structures at Uxmal. It is quadrangular in plan, with a court-yard in the centre. The quadrangle is formed of four long, disconnected structures: the front one, facing south, is 279 feet long; the eastern structure is 158 feet long, and contains four suites of rooms, fourteen in all, opening upon the court-yard; the rear building, on the north side of the court-yard, is 264 feet long, and contains twenty-eight rooms, also opening on the court-yard, and the western wing of the quadrangular structure contains fourteen rooms, and is 173 feet long. Above the cornice, which is about ten feet from the foundations, the buildings are richly decorated and ornamented with graven figures and pictures.

In the centre of the front corridor is a gateway 10 feet 8 inches wide, spanned by the triangular arch and leading to the court-yard. In the front wall of this front pavilion or wing, on either side of the arched entrance to the court-yard, are four doorways with wooden lintels opening to disconnected apartments averaging 24 feet long, 10 feet wide and 17 feet high to the top of the arch. These are the only rooms in the four pavilions that open directly to the outer world, except two long, narrow rooms at the ends of the south and north pavilions — which open towards the ends, and were probably the apartments of the guards and servants employed to watch the premises. The exterior of each of the other three pavilions is a dead wall, without openings of any sort.

Above the cornice, which encircles every building about 10 feet from the foundation, all the buildings are richly ornamented. The four great façades facing the court-yard are ornamented from end to end with the richest and most intricate carvings known in the art of the builders of Uxmal. This court-yard is 214 feet wide and 258 feet deep. It is overgrown with bushes and grass, and is the favorite nesting and brooding ground for large flocks of quail.

The lower portion of these buildings is constructed of solid blocks of square hewn stone. In the cornice the stones are especially large

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and are regularly dressed to match one another. In the upper portion there are large panels of hewn stone, with sculptured figures of idols and heroes and hearts and ornamental figures in graven relief, and the spaces between these panels are built of rough stone and plaster and once bore plaster ornamentation, but this has for the greater part crumbled away: intertwined among all the ornaments on each building are two huge serpents of stone, which run entirely around each structure.

At the north end of the court-yard, facing south toward the arched entrance, is a lofty building 264 feet long, standing on a mound 20 feet high. The ascent is by a grand staircase 95 feet wide, flanked on each side by a building with sculptured front and having three doorways, each leading to apartments within. The height of this building to the upper cornice is 25 feet. It has 13 doorways, over each of which rose a perpendicular wall 10 feet wide and 17 feet high above the cornice, making the whole height 42 feet from the ground. These lofty structures, erected no doubt to give grandeur and effect to the building, at a distance look like turrets; but only four of them are now standing. The whole grand façade, including the turrets, is ornamented with complicated and elaborate sculptures, among which are human figures rudely executed, two of which appear to be musicians — one playing on something like a harp and another upon an instrument somewhat resembling a guitar; a third is in sitting posture, with hands across his breast and tied by cords, the ends of which hang over his shoulders. This building has one curious feature: it is erected over and completely incloses a smaller one of older date. The doorways, walls and wooden lintels of the latter are all seen, and where the outer building is fallen the ornamented cornice of the inner one is visible.

In the rear of the eastern pavilion and only a short distance away is the House of the Birds, consisting of several ranges of buildings on lower terraces than the House of the Nuns. In one of these was found the largest rooms among the ruins of Uxmal. Two of them are each 53 feet long, 14 feet wide and about 20 feet high. In one of them are the remains of a mural painting, and in the other is the nearest approach to a perfect arch found among the ancient structures of Yucatan.

Adjoining this range of buildings is the so-called House of the Diviner. It is built upon a pyramidal mound that rises 88 feet high from the terrace, and is 235 feet long and 155 feet wide. The building is 17 feet high and incloses a court-yard 135 feet long and 85 feet wide. About 20 feet up from the base of the mound there are indications of a range of apartments, the entrances to which are visible still, with their lintels of sapan wood. They were not explored. About 60 feet up the mound there is a solid projecting platform, on which stands a building more elaborately ornamented than any other edifice in Uxmal. A great doorway opens upon the platform, leading the way to two apartments, the first 15 feet wide, 7 feet deep and 19 feet high, and the inner one 12 feet wide, 4 feet deep and 11 feet high.

The crowning structure of the mound is a long and narrow building measuring 72 feet in front and but 12 feet in depth. In the ornamentation of the walls of this building are evidences of the obscene rites and human sacrifices that characterized the religion of the people of Uxmal. The interior is divided into three apartments, the middle one 24 feet by 7, and those on each side 19 feet by 7. They have no communication with one another; two have their doors opening to the east and one to the west. A narrow platform projects from the four sides of this building, and up the eastern side of the mound ascends a grand staircase 102 feet high, 70 feet wide and containing 90 stone steps.

The Padre Cogolludo, the earliest historian of Uxmal, says that in the apartments of this building were the idols, and that there the people made their sacrifices of men, women and children.

"The High Priest," says he, "had in his Hand a large, broad and sharp Knife made of Flint. Another Priest carried a wooden Collar wrought like a Snake. The persons to be sacrificed were conducted one by one up the Steps stark naked, and, as soon as laid on the Stone, had the Collar put upon their Necks, and the four priests took hold of the hands and feet. Then the High Priest, with wonderful dexterity, riped up the Breast, tore out the Heart, reeking, with his Hands and showed it to the Sun, offering him the Heart and Steam that came from it. Then he turned to the Idol and threw it in his face, which done he kicked the body down the steps, and it never stopped till it came to the bottom, because they were very upright."

In the rear of the Casa del Gobernador is the Casa de Palomos, or House of the Pigeons. It is 240 feet long, and now but little more than a heap of ruins. The front is still standing, but the roof has collapsed and the apartments are but gigantic pots in which the vegetation of this tropical region finds luxuriant growth. Along the centre of the roof, running lengthwise, is a range of structures built in pyramidal form, of stone, about three feet thick and having small openings in them. They are nine in number, and were evidently the front walls of a series of large structures which have crumbled away. In the centre of this building is an archway 10 feet wide and leading into a court-yard 180 feet long and 150 feet deep. On the right and left are ranges of ruined buildings, and rising behind the left range is the large pyramid heretofore mentioned. Through the arch in the rear range of buildings one passes to another court-yard 100 feet long and 85 feet deep, flanked on either side by ruined buildings, on the opposite side of which is a flight of steps leading to the top of a mound 200 feet long, 120 feet wide and 50 feet high. Surrounding this is a building 100 feet long, 20 feet wide and about 30 feet high, divided into three apartments, the interior description of which would be the same as the House of the Diviner. The plastered walls show plain traces of mural pictures illustrative of religious ceremonies and royal pageants.

All over the grounds of this most interesting city of a dead civilization were found sculptured columns, images of historic personages and grotesque figures, principally distortions of the human face and form. On many of these are hieroglyphics and symbolic inscriptions, the purport of which has thus far been left to conjecture. Over all, the chemistry of the revolving years has sifted the mold of vegetation, deep and corrosive, and out of it rises a perennial growth of trees and shrubbery that the scientific explorer must first remove before the richest treasures of ancient Uxmal will be laid bare. — *New York Times.*

ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

DETAIL OF THE ENTRANCE PORCH, OSBORN HALL, NEW HAVEN, CONN. MR. BRUCE PRICE, ARCHITECT, NEW YORK, N. Y.

[Helio-chrome issued only with the International and Imperial Editions.]

A VAULT AT GREENWOOD CEMETERY, BROOKLYN, L. I. MESSRS. RENWICK, ASPINWALL & RUSSELL, ARCHITECTS, NEW YORK, N. Y.

THIS vault was erected for Mrs. Lispenard Stewart of this city. It is constructed of granite and lined with enamelled white brick and marble, the detail is Romanesque of the pure southern variety and is very carefully and effectively cut. The builders were Messrs. Pirrson & Renwick, New York.

A COTTAGE AT TUXEDO PARK, N. J. MESSRS. RENWICK, ASPINWALL & RUSSELL, ARCHITECTS, NEW YORK, N. Y.

THIS cottage is perched up near the summit on one of the heavily wooded hills which abound in the park. A winding road passes the front of the house which necessarily does not show in the drawing and access is thereby made much easier than would at first appear to be the case. The whole house is shingled except the cellar which is of stone with large buttresses which are quite a feature even from a distance. The contractor was Frank W. Moore, New York.

BUILDING FOR THE BOSTON REAL ESTATE TRUST, BOSTON, MASS. MESSRS. CABOT, EVERETT & MEAD, ARCHITECTS, BOSTON, MASS.

THIS building is now in course of erection at the corner of Congress and Purchase Streets, Boston. The front is to be of Sands Eastern water-struck brick; the floors and roof of hard pine, mill construction without furring. The owners are the Boston Real Estate Trust, and the builders Messrs. Gooch & Pray. Messrs. Bradley & Woodruff are to be the tenants.

NETLEY CORNERS, MINNEAPOLIS, MINN. MR. JAMES C. PLANT, ARCHITECT, MINNEAPOLIS, MINN.

CONGREGATIONAL CHURCH, WAKEFIELD, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

ST. LUKE'S CHURCH, MANSFIELD, O. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

[Additional Illustrations in the International Edition.]

HOUSE ON YORKSTRASSE, BERLIN, PRUSSIA. HERR RINTZ, ARCHITECT.

[Gelatine Print.]

HOUSE OF HERR HATNER, BUDA-PESTH, AUSTRIA. HERR ALFRED WELLISCH, ARCHITECT.

[Gelatine Print.]

A PORTE-COCHERE IN THE QUARTIER ST. GERMAIN, PARIS, FRANCE.

[Gelatine Print.]

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FROME UNION OFFICES. MESSRS. DRAKE & BRYAN, ARCHITECTS, BRISTOL, ENG.

THIS design was submitted in competition. The accommodation provided offices on the ground-floor for the clerk to guardians, superintendent, registrar, and highway and urban surveyors, together with large waiting-room and relieving-officer's room for the distribution of outdoor relief. On the upper floor were board and committee rooms, members' and paupers' anterooms, stores and the usual conveniences. The caretaker's lodge was adjoining, and at the rear of main building. Nothing, however, is being done by the guardians in the way of carrying out any scheme, and it appears that another addition must be made to the list of abortive competitions.

VICARAGE, TWEEDMOUTH, ENG. MR. F. R. WILSON, ALNWICK, ENG., DIOCESAN ARCHITECT.

THE site of the new vicarage at Tweedmouth, Northumberland, is pleasantly and centrally situated on rising ground above the road that lies between it and the churchyard. There was a building on a portion of the site, which has been converted into a commodious parochial-room, to which a covered approach has been made from the house.

HOUSE FOR MR. EDWIN LONG, R. A., HAMPSTEAD, ENG. MR. R. NORMAN SHAW, ARCHITECT.

THE CORRIDOR OF THE SAME. MR. R. NORMAN SHAW, ARCHITECT.

PLANS OF THE SAME. MR. R. NORMAN SHAW, ARCHITECT.

BUILDING LAW

NEW YORK, N. Y., March 25, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs,— The case of Lamb & Rich *vs.* A. J. Bloor was decided on Monday, March 24, in Superior Court, New York City, in favor of Lamb & Rich, by a verdict of $2,000 and costs. As a statement of this controversy was made in your columns, it seems not improper to advise you of the result, and to further state that, in pressing this case, we have been actuated by no feeling of anger whatsoever, but because of the principle involved. Very truly,

LAMB & RICH.

SUPERIOR COURT OF THE CITY OF NEW YORK. TRIAL TERM, PART III.

HUGH LAMB, *et al.*,
against
ALFRED J. BLOOR.

CHARGE TO THE JURY. TRUAX, J.

Gentlemen: In 1887, the plaintiffs and the defendant were architects doing business in the city of New York, and the defendant occupied the official position of Secretary to the Society or Institute of Architects in the United States. In December, 1887, the defendant published of the plaintiffs the following libellous publication: "To reputable architects: Respectable practitioners are hereby cautioned against entering into interprofessional relations with the firm of (Hugh) Lamb and (Chas. A.) Rich, architects, of New York City." Then follows a statement of a course or an alleged course of dealings between the plaintiffs and the defendant, and this statement: "The despicable course of this precious firm of architects in this matter is the more apparent when it is considered that the services rendered to them by the undersigned have been of the most exceptional kind," etc. (stating what he had done).

"Taking, therefore, into consideration his advisory relations with so many architects throughout the United States," ("his" means the defendant's), "particularly among the younger men, and the probability that, by his silence, this disreputable firm might feel emboldened to attempt a similar dishonorable course with other practitioners, and, above all, recognizing the necessity of the profession protecting itself from itself before it insists on being protected from Philistinism in the public, the undersigned hereby warns the fraternity against any voluntary interprofessional association with the said (Hugh) Lamb and Chas. A.) Rich." (Signed) "A. J. Bloor."

The publication was libellous; it was published of and concerning the plaintiffs as architects, and the plaintiffs are entitled to recover from the defendant such sum as you think will compensate them for the injury that they have sustained. You may not only give them a sum that will compensate them for the injury they have sustained, but, if you believe that the defendant was malicious in his publishing the libel about the plaintiffs, you may give a sum in excess of the compensatory sum — a sum by way of punishment to the defendant.

Now, whether or not the action of the defendant was malicious, can be determined by you from the communications between the plaintiffs and the defendant. You may infer from the communication that was written shortly prior to the publication of this libel, written by the defendant to the plaintiffs, in which he stated to them that, unless they paid, he would publish the libel, and you remember, in that connection, he sent a copy of this publication, and said that he would publish it. You may infer from this fact malice on the part of the defendant. And the letter in which he made this statement was in itself a violation of the laws of the State of New York; it was an attempt to blackmail the plaintiffs. The alleged agreement that the defendant says that he made with the plaintiffs, which, by the way, was not proved on the trial, that agreement stated by him in his paper, or attempted to be stated by him in his paper, was a violation of every principle of honesty on the part of the defendant. He had no right to make any such agreement; it was a corrupt agreement, and there is no evidence that it was made. He attempted to make it, but there is no evidence here that would warrant you in finding that the plaintiffs agreed with him in his attempt to make it.

I say, if you see fit to find from the communication of the defendant to the plaintiffs, the communication that enclosed this proposed libel, you may find that the defendant was actuated by malicious motives; and if you do find that he was actuated by malicious motives, you may punish him for so acting.

I leave the case with you, gentlemen.

I never have seen such an audacious attempt at extortion on the part of any man as on the part of the defendant in this action.

SOCIETIES

ST. LOUIS CHAPTER, A. I. A.

ST. LOUIS, MO., March 11, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — Will you kindly announce in your next issue that there has just been organized in this city a St. Louis Chapter of the American Institute of Architects, with the following officers and members: *President*, P. P. Furber; *Vice-President*, J. H. McNamara; *Secretary*, A. F. Rosenheim; *Treasurer*, C. K. Ramsey; *Associates:* T. C. Link, J. Beattie, T. B. Annan, T. J. Furlong, W. S. Eames, T. C. Young, C. W. Clark, K. Tully.

Yours truly, A. F. ROSENHEIM, *Secretary.*

THE T-SQUARE CLUB OF PHILADELPHIA.

THE last and most enthusiastic meeting for the season of the Philadelphia T-Square Club was held on Wednesday evening, February 26, at the office of T. P. Lonsdale, at the corner of Fourth and Walnut Streets.

In the regular competition subject, "A Town Pump," twelve drawings were submitted, and, after criticisms, mentions were awarded as follows: First mention, Crawford Coates; second mention, George Nattress; third mention, Frank Hayes.

The report of the Special Committee on artisan competitions in wood and metal designs was accepted, and the Committee was discharged. The matter was then placed entirely in the hands of the Executive Committee. This will inaugurate a series of competitions between the modellers, carvers and metal-workers of Philadelphia, the first of which will occur in October next. The programme will be furnished for publication later. Certificates of awards, bearing the seal of the Club and the officers' signatures, will be presented to the successful competitors. The Art Club Architectural Committee reported progress.

From the fact that heretofore the Club has had no permanent quarters, but has held its meetings in the offices of the professional members, as well as from the economical way in which all business matters have been handled, the dues have been but nominal; but now that it is growing so rapidly, having doubled its membership in the last eighteen months, permanent and convenient quarters have been found an absolute necessity. This will require that the dues be raised to at least $5 per annum. In accordance with these demands, the Executive Committee was instructed to secure a room for the Club, and have it ready for occupancy at the next regular meeting in October, 1890.

The next competition will be "A Seal for the Philadelphia T-Square Club." The successful competitors for this season will be given later, there being a tie at present for second place.

The following were elected to membership: Oscar Wenderoth, George Morris and Charles E. Lee.

The thanks of the Club were then extended to Mr. Lonsdale for his hospitality, after which the meeting adjourned.

LOUIS C. HICKMAN, *President.*
G. C. PARMETER, *Secretary.*

DEPARTMENT OF ARCHITECTURE, BROOKLYN INSTITUTE.

AT a meeting of the Department of Architecture of the Brooklyn Institute, March 19, 1890, the following preamble and resolutions were adopted:

Whereas, An act has been introduced in the Assembly of the Legislature of this State, and referred to the Committee of Ways and Means, which reads as follows, to wit:

AN ACT FIXING THE SALARY OF THE COMMISSIONER OF THE CAPITOL.

The salary of the Capitol Commissioner is hereby fixed at ten thousand dollars per annum. And it shall be his duty, whenever requested by the proper authorities, to furnish plans and specifications

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for all public buildings belonging to the State, and to render such services as may be required, without further compensation.

This act shall take effect immediately.

Resolved, That in the judgment of this Department of Architecture of the Brooklyn Institute, the passage of such an act, which is substantially the creation of office of State Architect, will be detrimental to the interests of the people, and the promotion of architecture by preventing free and open competition.

We are, therefore, opposed to the office of State Architect as not in accord with the culture of the times and the liberality of our institutions, which call for the highest excellence obtainable — the best from the best.

Resolved, That feeling confident we voice every architectural institution in the land, we would respectfully urge that the plans for all public buildings — Federal or State — be given out among our architects for competition, who shall be compensated therefor, and that none but architects be selected to pass judgment upon the architectural merits of such plans.

In thus protesting against the creation of a Government or State Architect, we do so not believing it possible for any individual to possess originality sufficient which, in the designing of a number of public buildings, will not wane into more or less commonplaceness.

Neither do we favor any individual's peculiar standard of architecture, or interference with, or biasing of, that novelty and attractiveness which is rapidly giving American buildings a prestige.

While thus opposing the office of State Architect, we most respectfully suggest this substitute:

That upon the recommendations to the Governor of the State, or the insertion of the names in the act, of three or five architects, from any institution recognized among the profession as authority in architecture, they be appointed and constitute an Advisory Board, having the management of the competition, subject to the rules of said institutions, and of the building until completed, being paid per session for their services; the architects successful in the competition to receive the customary fee, to be accountable to the Advisory Board, which in its turn reports to the State authorities.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

ONE WAY OF ARRANGING ARCHITECTURAL PRINTS.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — May I take advantage of this writing and describe for some of the readers of the *American Architect*, my system of keeping photographs, sketches and illustrations?

I have had made a case divided into compartments each 6¾″ high x 15″ wide x 12½″ deep; in each compartment are two cloth-bound cardboard boxes 3¼″ x 14¾″ x 12″, and these opening at the outer end, both up and down, may be partly drawn out and opened, to get at the contents. On the outside of each cardboard box, is a label.

The lower part of the case contains boxes 3¼″ x 14¾″ x 18″, for larger photos., etc., these two sizes seem sufficient. I have found that photos. mounted on cloth — when kept flat — are in many ways preferable; take up *much* less room, weigh less, are more portable, and are easily put on the wall for study. I have made about fifty divisions — and sub-divisions of these illustrations — such as:

Churches. — Gothic, Romanesque, Byzantine and Renaissance.

Residences. — Châteaux; detached: half-timbered houses, brick and stone mixed, brick (or stone) and frame; *en bloc;* city houses, apartments and hotels.

Details. — Mantels, stairs, furniture, carving — wood and stone, decoration, capitals and bases, metal-work, pulpits, fonts, organ-cases, doorways, gateways, entrances, loggias, cloisters, arcades, towers and spires, domes and roofs, fountains, memorials, tombs.

Public Buildings.— Post-offices, railway stations, court-houses, town-halls, gymnasiums and baths, club-houses, Y. M. C. A., libraries, schools and colleges, hospitals and jails.

Business Buildings. — Storehouses, office-buildings, banks, etc.

Everything pertaining to each subject is put in its own box, and in this connection I should like to say to the editors (or publishers) of the *American Architect*, that their illustrations would be more serviceable if, in the case of "Envois of Rotch Scholarship, envois of *American Architect*, and the cuts on page 10," the page would contain only examples of one subject — if there be not enough matter for a double page, then make it a single page, which is more available for reference, whether the plates be bound or kept loose.

I am very truly, WM. MARTIN AIKEN.

A QUESTION AS TO COMPENSATION.

BOSTON, MASS., March 17, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Would you kindly advise us through your columns of the usual professional charges in the understated case. An architect is engaged to prepare plans for a brick church, preliminary sketches for which are submitted to, and approved of by the pastor, who instructs him (the architect) to prepare full working-drawings and specifications. In pursuance of these instructions such drawings ands pecifications are made, submitted and approved; and the foundation work contracted for, and put in. When the bids for the superstructure are received, the pastor is of opinion that the means at his disposal do not warrant such an expenditure, and the architect is instructed to prepare working-drawings and specifications for a frame church of similar design, or with only such alterations as were rendered necessary by the new materials employed in the construction. Such designs were made, submitted and approved of, bids received, and the design finally abandoned.

The architect was now instructed to prepare another design of equal seating capacity, and of the same general dimensions as the former. This last was an entirely new design, worked out in a different style from the others, the plans were approved of, bids received, contracts entered into, and the church erected and finished under the architect's supervision.

The information required is, what would be a fair charge by commission for:

1st. The original design for brick church?

2d. For changing the design from brick to wood, the designs being essentially similar?

3d. For the new design for frame church erected under the architect's supervision?

Yours, etc., CONSTANT READER.

[Much the best way in such cases is for the architect to charge the usual commission on the cost of the building actually executed, and, for the work abandoned, to estimate as nearly as possible the time spent on it by himself and his assistants, and make a reasonable extra charge on this basis. No one could object to such an extra bill, and, if based on time actually spent, the architect would get a fair remuneration, without the wrangling over whether the alterations were more or less troublesome than designing new work and so on which would probably follow the presentation of a bill for a fixed percentage. — EDS. AMERICAN ARCHITECT.]

BOOKS ON SCHOOL-HOUSES.

LANCASTER, PA.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Would you please inform me where I can obtain the best work or works upon modern school-house construction.

Your answer will greatly oblige, SCHOOL BOARD.

[Robson's "School Architecture" published in Weales's Series; a pamphlet by T. M. Clark, issued by the United States Bureau of Education; the last Annual Report of the Massachusetts Board of State Police; the files of the *Engineering and Building Record*. — EDS. AMERICAN ARCHITECT.]

THE NEW YORK OBELISK AND ITS PROTECTING COATING.

NEW YORK. N. Y. March 24, 1890.

TO THE EDITORS OF THE AMERICAN ARCHITECT:

Dear Sirs, — The statements (copied from the *Scientific American*) which appear in your issue of March 22, respecting the condition of the obelisk in the Central Park, New York, are absolutely without foundation.

The *Scientific American* was evidently misled by an article in the New York *Herald* of November 24, 1889, instigated by parties opposed to the paraffine process.

A critical examination of the obelisk has since been made by experts, with the following result, which I copy from the New York *Herald* of December 23, 1889:

"Thus far the examination has been perfectly satisfactory, not the slightest disintegration has been discovered, and there is no evidence whatever of any injury having been done by the application of the paraffine process."

The New York *Herald* was unwittingly duped in its first article. The one of later date is from the report of its own specially detailed representative, who daily watched the examination of the obelisk, and credit is due to the New York *Herald* for the prompt and honorable manner in which it made the correction as soon as it was satisfied that the obelisk was safely preserved.

As such an article as the one to which I refer in your widely-read paper is likely to lead to serious misapprehension respecting the condition of the obelisk, I think it only fair to put you right in this matter, and respectfully request you to publish the above in justice to all interested. ROBERT M. CAFFALL.

[WE are sorry to have been beguiled into making unwarrantable statements and inferences. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

DR. SALVIATI. — The death of Dr. Salviati is announced at the age of seventy-four. His name has been to a great extent identified in Venice and in England with the revival of the art of mosaic and of the Venetian artistic glass industry. He was not himself an artist or designer, and his efforts in setting up again these two artistic crafts on their old ground seem to have been prompted a good deal by patriotic feeling, coupled with that kind of insight which enables the possessor of it to foresee a probable demand and provide for it. In as far as the Murano glass manufacture was concerned, it was carried on in too archæological a spirit, even to the conscious production of irregularities

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and crookedness of make; a kind of thing which took the public when it was novel, but which the best artists saw through and on occasion denounced. In regard to this kind of effort the Murano glasswork has had its day of fashion, and capricious modern taste is getting tired of it, as is pretty sure to be the case with all art work which is a revival of old fashions for the sake of revival; but there is no doubt that incidentally it gave an impulse to the long-forgotten idea that table-glass was a thing capable of beautiful artistic design and expression, and not merely a utilitarian class of goods for practical use; and most of the other efforts at giving artistic form and spirit to glass utensils have been at all events stimulated by the example of Salviati's enterprise or the desire to rival it. In regard to mosaic, the position taken by Salviati and his coadjutors is more stable. They provided for the manufacture of the material and the proper carrying out of the process of fixing; and though a good deal of too archaic work was done by them for church architecture in the high tide of the Gothic movement, the more rational artistic use of the material by designers has now brought mosaic decoration into higher repute, and the gratitude of the artistic world is equally due to the man who recalled and revived the use of such a splendid medium for architectural decoration. — *The Builder.*

Castello San Angelo, Rome. — There is hope that the polygonal mediæval towers of the castle of St. Angelo may after all not be included in the work of destruction commenced in carrying on the Tiber Embankment. The President of the Artistic International Association, Signor Palmaroli, and the architect, Signor Placentini, have waited on the Minister of Public Instruction to make fresh representations on the subject. His excellency showed himself well-informed about the matter, and expressed to them the extremely favorable impression he had received from the perusal of Captain Borgatti's project, which, it may be remembered, was in favor of letting the new Riverside Road pass behind the castle instead of in front of it, the latter course necessitating the destruction of some historically interesting portions. Several other members of the cabinet are against the scheme of destruction; but the Minister of Public Works, in whose hands the affair rests, is obstinately bent upon it. Signor Finali, though doubtless an able public servant in other matters, does not possess the kind of culture which would enable him to appreciate, or even to understand, the weight of his opponents' arguments. The other ministers, however, find their hands strengthened by the support of the artists and of a large portion of the press, and it is now decided that there shall be a conference, with a view to determine the point in dispute, between the Ministers of War and Public Instruction and the Minister of Public Works. The newspaper which enjoys the reputation of being Signor Crispi's organ has all along been in favor of Captain Borgatti's plan. — *London Daily Telegraph.*

The New National Portrait Gallery. — The New National Portrait Gallery will stand back of the National Gallery on Trafalgar Square, London, and the architect will be Ewan Christian. He has been cruising about the Continent studying edifices in use as galleries for works of art. Hemming's Row, behind the National Gallery, will have to be closed, if the present designs are accepted. There will be forty feet between the backs of the new gallery and the old, the front of the former being on the side street which enters Trafalgar Square. But on the east side the two buildings will meet without being connected, and there it is proposed that the pseudo-Greek motives of the façade of the old structure shall be continued round the corner along the east side till the new structure is met. The architect of the old building was Wilkins. He was granted £70,000 and the Corinthian columns from Carlton House wherewith to decorate the edifice. The new structure will consist of a tower abutting on the old, with a stone building of three stories somewhat Florentine in style. The entrance will face Chandos Street. — *New York Times.*

Fireproof Whitewash. — It is found that a most effective composition for fireproofing exterior surfaces may be formed by slaking a sufficient quantity of freshly-burned quicklime of the best grade, and when the slaking is complete there is added such an amount of skim-milk, or water in its absence, as will make the liquid of the consistency of cream. To every ten gallons of this liquid are added separately and in powder, stirring constantly, the following ingredients in the order named: two pounds of alum, twenty-four ounces sub-carbonate of potassium or commercial potash and one pound of common salt. If white paint is desired a further addition is made to the liquid, though the whiteness is found to be improved by a few ounces of plaster-of-Paris. Lampblack has the effect of giving a number of shades from slate color to black. Whatever tint is used it is incorporated at this stage, and the whole, after being strained through a sieve, is run through a paint-mill. When ready to apply the paint is heated nearly to the boiling point of water, and is put on in its hot condition. It is found that the addition of a quantity of fine white sand to this composition renders it a valuable covering for roofs and crumbling brick walls, which it serves to protect. — *The English Mechanic.*

The Mummy Cats of Beni Hassan. — We spoke recently of the arrival in Liverpool of 180,000 mummy cats, which, after having lain in their sacred burial place at Beni Hassan, in Egypt, for 3,000 years or so, are now about to fill their final and probably most useful function of manuring English land. Farmers are indebted for this excellent lot of twenty tons of manure to the lucky accident which befel an Egyptian who, while dying, fell into a pit which proved to be a subterranean cave completely filled with mummy cats, each one being separately embalmed and wrapped up after the usual fashion of Egyptian mummies. Pussy of B. C. 2,000 was a sacred object to a section of the ancient Egyptians, and when a cat died — as even a cat eventually must — it was buried with as much honor as any human being. The finder, having reported his discovery, laborers were soon at work and turned out tens of thousands of the mummies. Some were taken by the farmers of the place, others went to a merchant in Alexandria, who shipped them to Liverpool, where another merchant, a local fertilizer, bought the consignment at £3 13s. 9d a ton. The auctioneer, adding insult to injury, knocked down the lot of 180,000 cats with the head of one of them as a hammer. To such base uses may the gods of Egypt come! — *Exchange.*

An Anecdotic Statue of the Emperor Frederick. — A statue is about to be dedicated at Kaiserslautern which is destined to commemorate a touching episode in the life of the late Emperor Frederick. A few years before his accession to the throne, when still Crown Prince, he happened to visit the well-known hospital of the Protestant Deaconesses at Kaiserslautern. With his customary kindness, he spoke to many of the patients. Among the latter was a little cripple, the son of an infantry sergeant. On finding the child bore his name, he took him up in his arms, and began to caress and to fondle him. Encouraged by these demonstrations of good-nature, the little fellow's shyness disappeared, and he began to play with the stars and decorations worn by the Crown Prince. The latter, on observing this, turned to those present, and exclaimed, half-mockingly, "Well, I am glad that these baubles have become of some use after all!" The statue, which is of bronze and slightly above life-size, is set up in the great quadrangle of the hospital, and represents the Crown Prince holding the little cripple, while the latter is toying with his decorations and orders. — *London Standard.*

Art at the Vatican. — A distinguished Egyptologist, just returned from a considerable stay in Italy, has given a London correspondent some remarks about the Vatican Museum, at Rome, which are particularly striking so far as they refer to the treatment which Egyptian antiquities have received at the hands of the curators of two or three generations ago; statues which were incomplete, say, on account of the destruction of a limb or a head, have been restored according to no principle but that of comeliness of form and outline. This has been done without regard to anything but appearances, and ethnography and science and the fitness of things in general were scornfully subordinated to the sentiment of what was understood to be beauty, but which really was incongruity. The antiques thus pieced together with modern restorations are frequently so far vitiated as to have become not reproductions or conscientious imitations of the parts of the body which were originally there, but virtually forgeries, the tendency of which is rather to mislead than to inform. — *Pall Mall Gazette.*

TRADE SURVEYS

The influences which have been at work for years past to drive manufacturing enterprise out of large cities are still active. In the long run, no particular harm will be done to the cities, and the enterprises which take advantage of cheaper locations will be profited. A decentralization is in progress, and it is a very necessary departure. New conditions are arising; new markets are opening; new sources of fuel-supply are being developed; new rules concerning the distribution of traffic and merchandise are being established. As a result, manufacturing conditions, interests and requirements are being gradually modified. Years ago, the larger cities presented certain attractions and advantages to the manufacturer which they do not now present. Some of our largest and most prosperous industrial establishments are in localities remote from large cities. New investors, instead of purchasing sites in large cities, as was the custom some few years ago, now are apt to select, as the theatre of projected enterprise, some remote locality, which, until recently, has never attracted the eye of the manufacturer. In several sections of Texas, Arkansas and Colorado little industrial communities are springing up, which are the forerunners of many others. According to a good authority, between two and three hundred manufacturing towns have sprung up within the past twelve months, of which Middlesborough, Ky., may be taken as a fair sample. A scattering of industrial energy seems to be going on, but there is method in it, and necessity for it. The latest developments in monetary centres are indicative of stringency, although reports say "money is easy." An unusual outflow of currency westward is now in progress, owing to the urgent requirements in that direction. Banking facilities, abundant though they seem to be, are really insufficient. Business men recognize the possibility of danger, and are seeking to strengthen their credit, and to avoid the necessity for suddenly realizing upon their products, by a wise and careful restriction. The fact is recognized that these fluctuations in the volume of currency are dangerous, and that they forbode greater or less trouble in the future.

Developments in the labor field during the past week have been unimportant. It is impossible to arrive at any definite conclusion as to the purpose of the great body of the workers. Here and there isolated organizations have passed resolutions to do this and not do that; but there seems to be a lack of cohesion among them; one seems to be waiting upon the other to act. The leaders have resolved to avoid the responsibility of possible failure by granting full liberty of action to all subordinate organizations. This is the way the matter now rests. Employers have shown a remarkable willingness to compromise, and wherever reasonable concessions will avail, work will not be interfered with. Every industry is active. Beginning with the iron trade prices are still declining; but, while this is against the iron and steel makers, it is favorable to buyers and users. The lumbermen have entered upon a season which everything seems to prove will be an active one, with good prices. The coal-miners — except in the anthracite region — are busily employed. The coke-workers have a season's business secured, and at good prices. The hardware manufacturers are working full time, and a considerable percentage of them overtime. The boot and shoe manufacturers have excellent prospects. Manufacturers of electrical equipments and supplies are overcrowded with work. Makers of engines and boilers report unprecedented activity. The "boomers" of new towns report no difficulty in selling their properties. The builders of locomotive engines are crowded with work, and several establishments are compelled to increase capacity. The ship-builders are all busy; new machinery is being put in old yards, and a number of large new yards are to be established. The car-builders have all the work they can do. Throughout the Ohio Valley, and in several sections of the South, floods have seriously interfered with business, causing delays, but the losses have not been very heavy.

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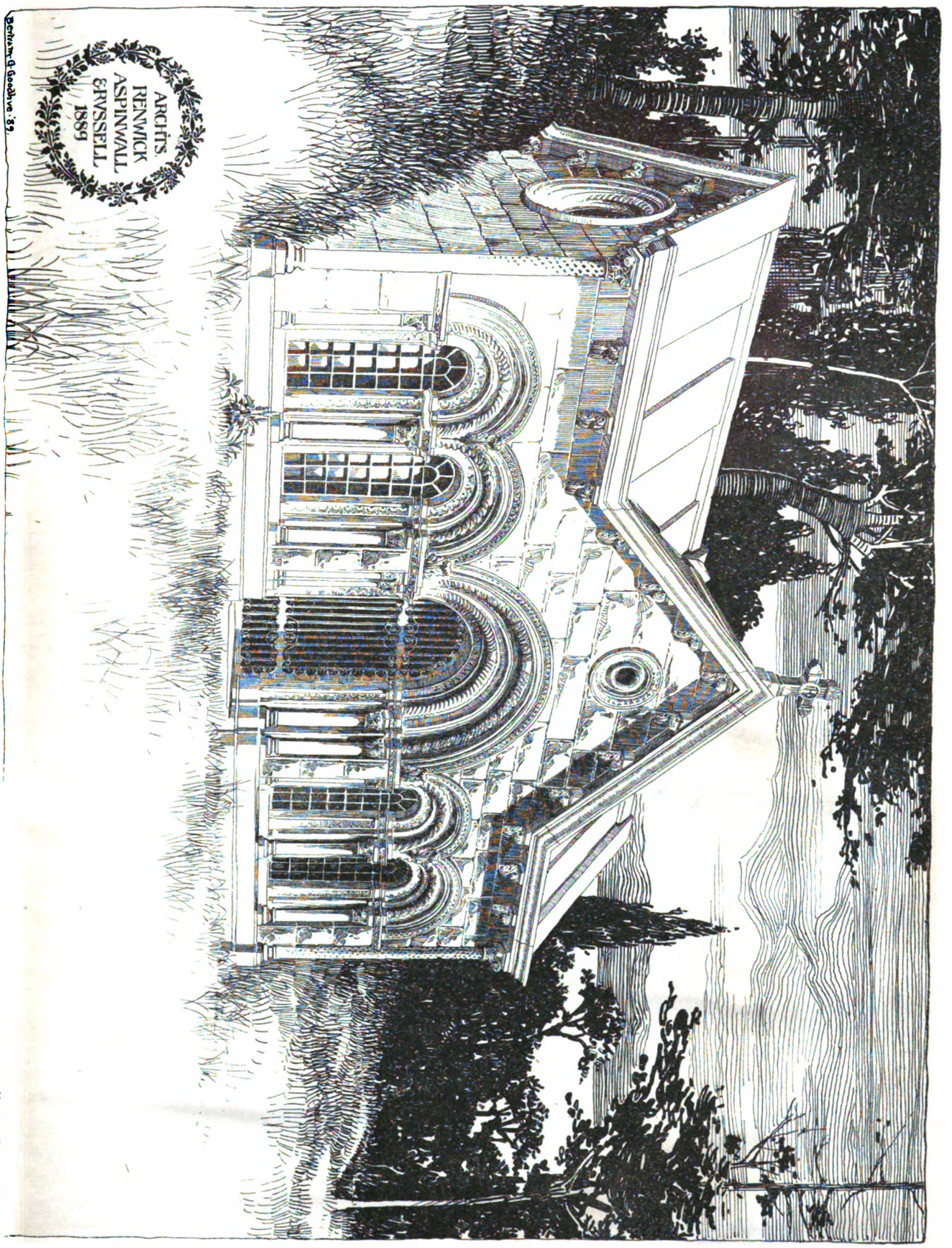

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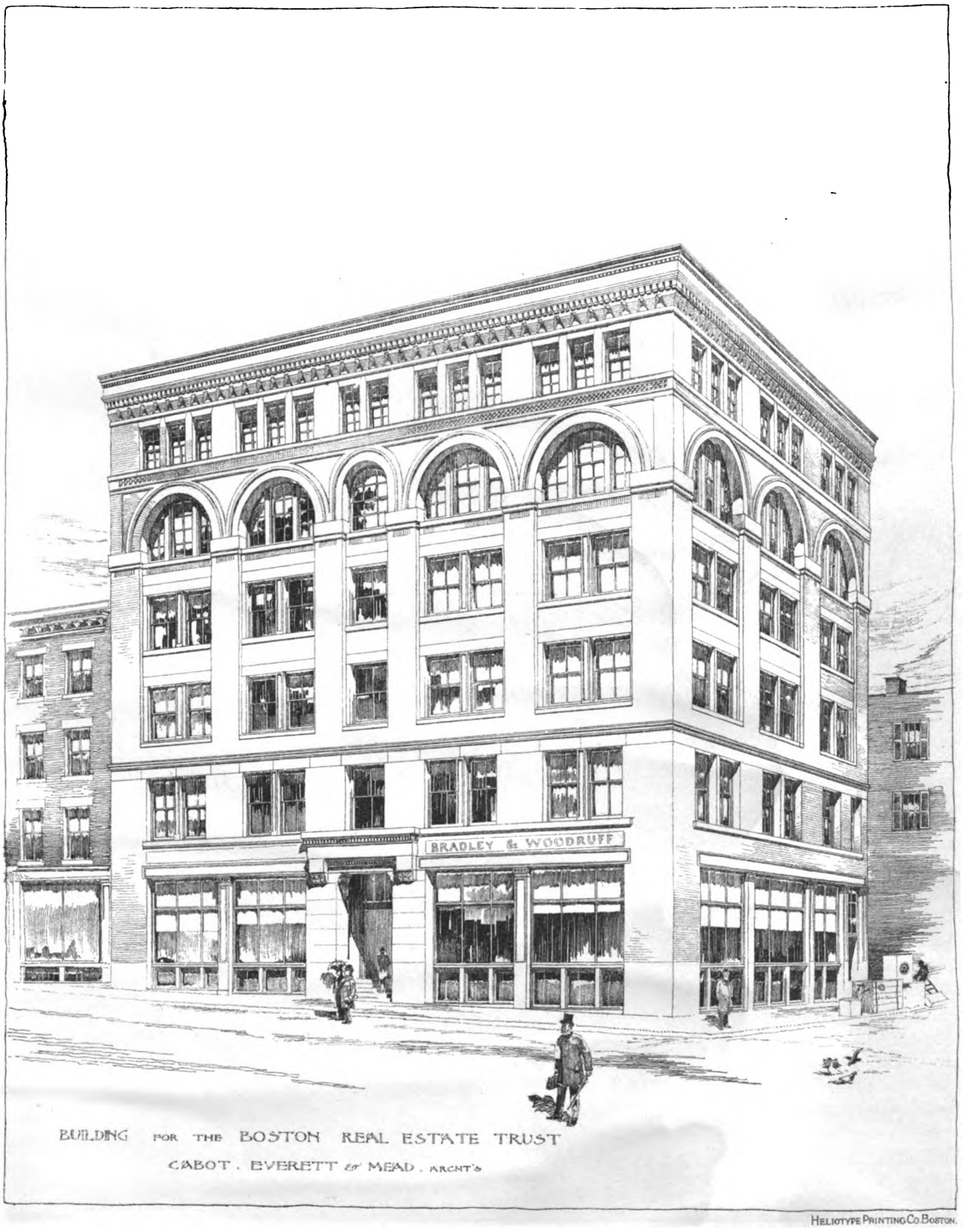

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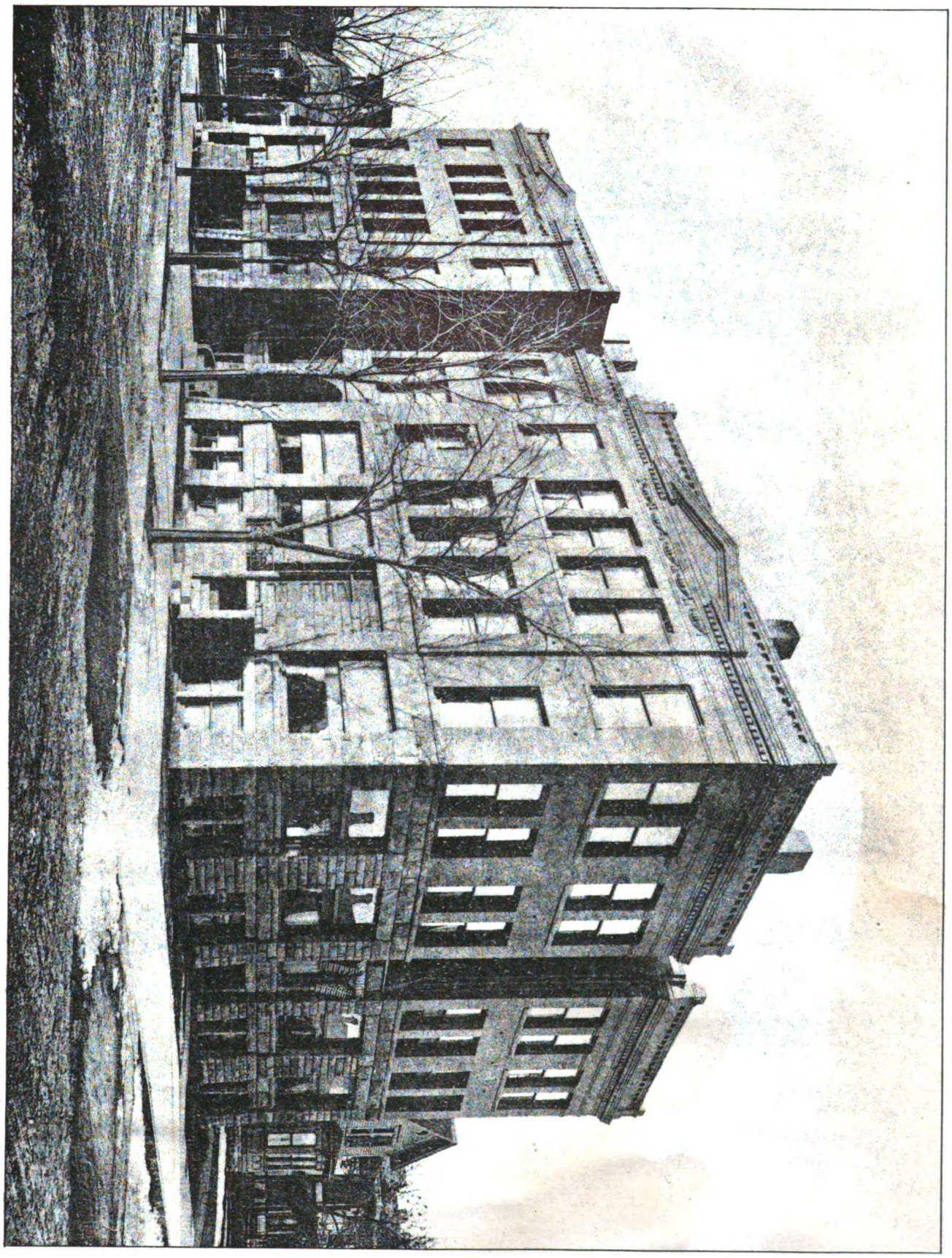

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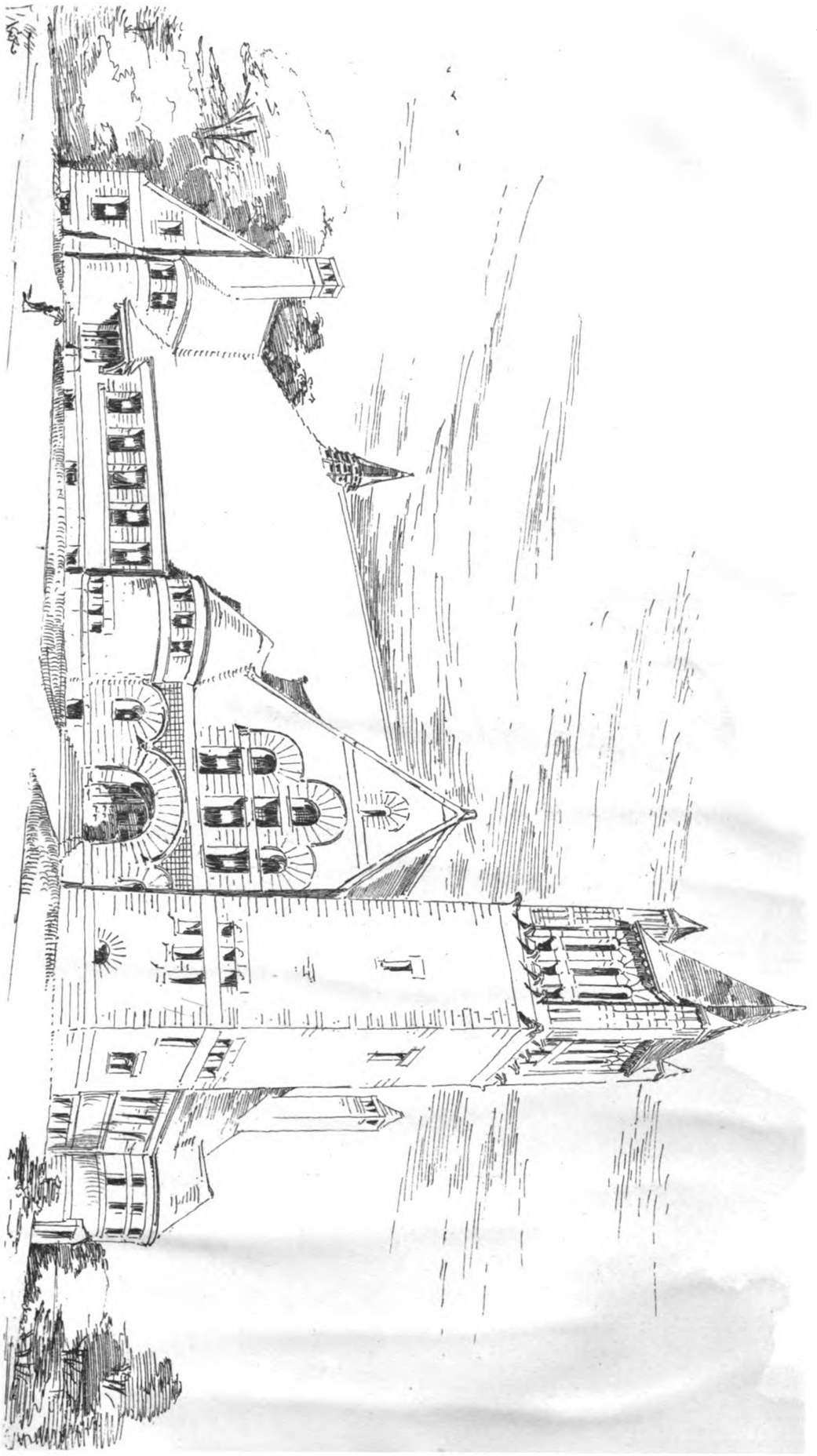

Congregational Church ... Wakefield Mass.

H. W. Hartwell & Wm. C. Richardson, Architects, 68 Devonshire St. Boston.

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